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FLOOD INSURANCE STUDY

COMPLETED
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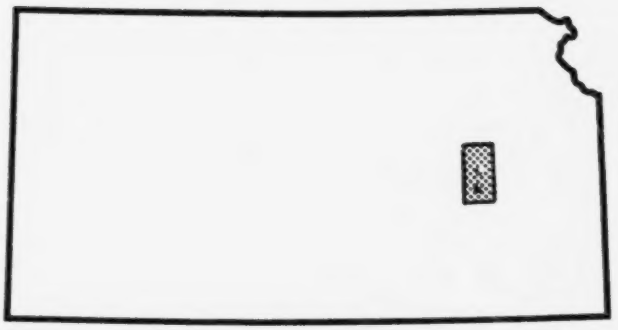
COUNTY OF LYON, KANSAS

UNINCORPORATED AREAS



MAY 17, 1982

Federal Emergency Management Agency

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Flood Boundary and Floodway Map Index
Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map Index
Flood Insurance Rate Map

FLOOD INSURANCE STUDY

COUNTY OF LYON, KANSAS
UNINCORPORATED AREAS

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Unincorporated Areas of Lyon County, Kansas, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert Lyon County to the regular program of flood insurance by the Federal Emergency Management Agency (FEMA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 44 CFR, 60.3 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgements

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Geological Survey, Water Resources Division, Kansas District, for the Federal Emergency Management, under Inter-Agency Agreement No. H-9-77, Project Order No. 18. This study was completed in June 1980.

1.3 Coordination

Streams requiring detailed study were identified at a meeting attended by representatives of the Study Contractor, FEMA, the Kansas State Board of Agriculture (KSBA), and representatives of Lyon County on December 8, 1976. Flood-frequency discharges for the Neosho River were coordinated with the U.S. Army Corps of Engineers (COE), Tulsa District.

On October 16, 1980, the preliminary results of the study were reviewed at the intermediate meeting attended by representatives of the Study Contractor, FEMA, the KSBA, and community officials.

On October 15, 1981, the results of the work by the Study Contractor were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the unincorporated areas of Lyon County, Kansas. The area of study is shown on the Vicinity Map (Figure 1).

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through June 1985.

Approximate methods of analysis were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by FEMA and the unincorporated areas of Lyon County. Incorporated communities are not included in this study.

The flooding sources studied by detailed methods are listed in Table 1.

2.2 Community Description

Lyon County is located in the east-central portion of Kansas approximately 80 miles northeast of Wichita and 96 miles southwest of Kansas City. Lyon County is surrounded by Wabaunsee County to the north, Osage and Coffey Counties to the east, Greenwood County to the south, Chase County and Morris County to the west. The total land area contained within the county limits is 840 square miles. According to U.S. Census Bureau figures, the population has increased from 26,928 in 1960 to 32,071 in 1970, of which 72.7 per cent was urban (Reference 1).

The climate in Lyon County is typical of the Midwest region of the U.S. with wide fluctuations in temperature, precipitation and humidity. Frequent weather changes occur both from day-to-day and from season-to-season. Summer precipitation generally results from local thunderstorm activity of high intensity and short duration. However, general rainfalls of moderate to heavy intensities with varied durations are not uncommon to the area and may develop at any time of the year. The average annual precipitation totals approximately 37 inches and the average annual temperature is 55 degrees Fahrenheit (Reference 2).

Lyon County is in the Osage Cuesta Plain section of the Flint Hills Uplands. The main topographic features are the southeast-trending Neosho River and the east-trending Cottonwood River valleys and the uplands, which consist of rounded to steep hills. The slopes toward the valleys are rather steep, resulting in rapid runoff from the tributary streams. The soil in the alluvial valleys is silty clay and silty clay loams on the uplands.

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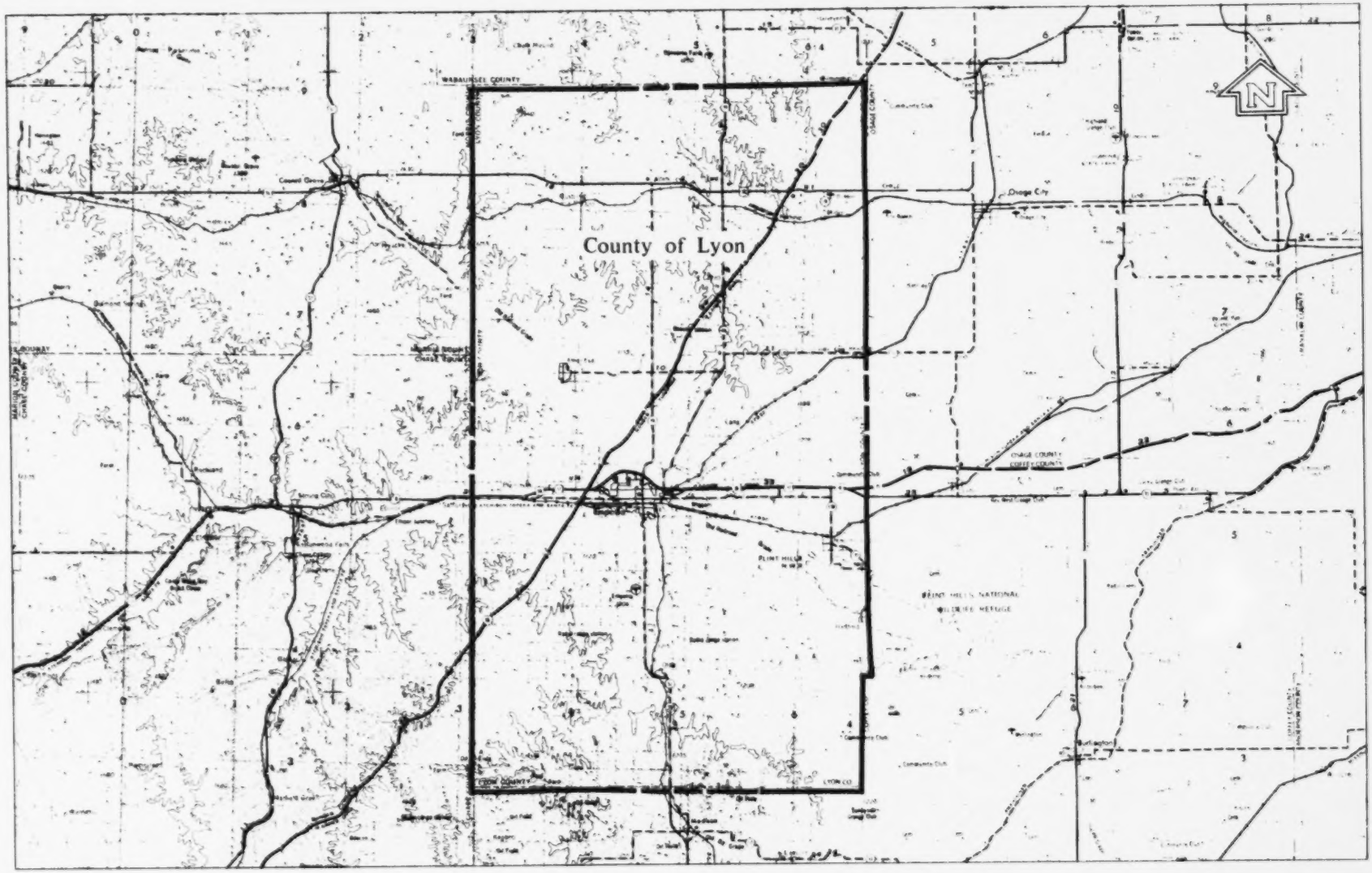

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

APPROXIMATE SCALE

8 0 8 16 24 MILES

3

VICINITY MAP

TABLE 1: FLOODING SOURCES

FLOODING SOURCE	DESCRIPTION OF STUDY LIMITS FROM	TO
DETAILED FLOODING SOURCES		
COTTONWOOD RIVER	Mouth	Kansas Turnpike
NEOSHO RIVER	2,000 feet downstream confluence with Dry Creek	Just upstream County Road 413
EAGLE CREEK	11,500 feet downstream State Highway 99	7,500 feet upstream of confluence with Olpe River outlet
DOW CREEK	Mouth	Just upstream State Highway 99
DRY CREEK	Mouth	25,400 feet above mouth
ALLEN CREEK	Mouth	31,100 feet above mouth
PESTER CREEK	1 mile downstream County Road 412	2,500 feet upstream corporate limits of Americus

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The Neosho River flows in a southeasterly direction through the central portion of the county. Pester Creek, Allen Creek, Dow Creek and Dry Creek are left bank tributaries to the Neosho River. The Cottonwood River flows in an easterly direction and joins the Neosho River at the east-central portion of the county. Eagle Creek also flows in an easterly direction and is a right bank tributary to the Neosho River.

Except for a few scattered residences and farm buildings, the flood plain areas in Lyon County are devoted mostly to agricultural use.

2.3 Principal Flood Problems

In the past, overflow from the Neosho River and the Cottonwood River has caused periodic damage through the county. Because of the broad flood plains of these streams, large areas of land within the county can become inundated. The most severe flooding to occur in the Neosho River basin and the Cottonwood River basin occurred on July 11, 1951. The frequency of occurrence of this flood is estimated to be about 500 years. The second highest major floods occurring on the Cottonwood River and the Neosho River were September 13, 1926 and May 23, 1961, respectively. Both of these floods had a frequency greater than 50 years.

Floods on the smaller streams of Lyon County have occurred after local heavy rainstorms. Small drainage basin areas and fairly steep slopes cause quick flood rises with little warning.

2.4 Flood Protection Measures

There are two Federal (COE, Tulsa District) flood-control structures located upstream of the study areas. The Council Grove Lake, located at river mile 449.9 on the Neosho River, was completed in October 1964. Flood-control capacity is 265,400 acre-feet, controlling a drainage area of 246 square miles. This project controls about 39 per cent of the drainage area above Emporia. Flood flows are regulated by reservoir releases for maximum benefit downstream.

The second COE flood-control structure is Marion Lake located on the Cottonwood River at river mile 126.7. It was completed in February 1968 with a flood-control storage of 186,500 acre-feet. This project controls about 11 per cent of the drainage area above Emporia. Flood flows are regulated by reservoir releases for maximum benefits downstream.

The low-water dams on the Neosho River and the Cottonwood River are small and have minimal storage effects. There is a minimal amount of levee work on Allen Creek for agriculture protection; otherwise there are no flood-protection works on streams in the study area.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood

plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 per cent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one per cent chance of annual occurrence) in any 50-year period is about 40 per cent (four in ten), and for any 90-year period, the risk increases to about 60 per cent (six in ten). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail affecting the community.

Regulated streams in this study include the Neosho River and the Cottonwood River. The peak discharge-frequency relationship for these two rivers was provided by the Tulsa District COE. These discharges were developed by hydrograph analyses incorporating reservoir system operations (Reference 3).

The tabulated 10-, 50- and 100-year flood-frequency discharges for the remaining streams studied in detail were calculated using the regional flood-frequency regression equation published in Kansas Water Resources Board Technical Report No. 11 (Reference 4). The 500-year flood discharge for each stream was calculated by the index flood method, using 10.9 times the two-year flood. The 10.9 coefficient was determined from an analysis of results from the log-Pearson Type III statistical analysis of the annual peak series of long-term, regional U.S. Geological Survey (USGS) gaging station records.

Peak discharges for the 10-, 50-, 100-, and 500-year floods of each flooding source studied in detail in the community are shown in Table 2.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the streams in the community were carried out to provide estimates of the elevations of the floods of the selected recurrence intervals along each flooding source studied in detail.

Cross sections for the backwater analyses of the streams studied in detail were obtained from aerial photographs at a scale of 1:4800 and field surveys (Reference 5). All bridges, dams and culverts were field checked to obtain elevation data and structural geometry.

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TABLE 2 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA SQ MILES	PEAK DISCHARGES (CFS) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
NEOSHO RIVER					
At Neosho Rapids	2,740	35,000	76,000	130,000	240,000
Confluence with Cottonwood River	800	27,500	62,500	83,500	152,000
COTTONWOOD RIVER					
At confluence with Neosho River	1,908	33,500	75,000	105,000	220,000
DRY CREEK					
At mouth	20.0	5,000	8,800	10,600	18,700
DOW CREEK					
At mouth	43.2	7,490	13,200	15,900	28,600
ALLEN CREEK					
At confluence with Troublesome Creek	49.0	8,000	14,100	17,000	30,600
PESTER CREEK					
About 5,000 feet downstream County Road 412	7.73	3,030	5,350	6,470	11,100
About 3,200 feet upstream County Road 412	3.62	2,040	3,600	4,350	7,330
At Sycamore Street	3.03	1,860	3,300	3,960	6,650
EAGLE CREEK					
At State Highway 57	18.6	4,810	8,470	10,200	18,000
Above Olpe Lake	15.1	4,310	7,600	9,190	16,040

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles. For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map.

Channel roughness coefficients (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and flood plain areas. Roughness values for the main channels ranged from 0.045 to 0.06, with flood plain roughness values ranging from 0.04 to 0.065 for all floods.

Starting water-surface elevations for the streams studied in detail were calculated using the slope-conveyance method and profile convergence. Water-surface elevations of floods of the selected recurrence intervals were computed through use of the USGS E-431 step-backwater computer program (Reference 6). Selected culvert analyses were performed using the USGS A526 computer program (Reference 7).

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

The hydraulic analyses for this study are based only on the effects of unobstructed flow. The flood elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain unobstructed and if channel and overbank conditions remain essentially the same as ascertained during this study.

All elevations are referenced from National Geodetic Vertical Datum of 1929 (NGVD); elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by FEMA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100-year and the 500-year floods have been delineated using the elevations determined at each cross section; between cross sections the boundaries were interpolated using topographic maps prepared from aerial photographs at a scale of 1:4800 with a contour interval of five feet (Reference 5).

The 100-year flood boundaries for approximate studied streams were obtained from the Flood Hazard Boundary Map (Reference 8).

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map. Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to lack of detailed topographical information or to limitations of the map scale, such areas are not shown. In cases where the 100-year and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of FEMA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodway recommended in this study was computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 3).

As shown on the Flood Boundary and Floodway Map, the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
NEOSHO RIVER								
A	372.53	6250	59,616	2.18	1073.2	1073.2	1074.2	1.0
B	373.21	9350	85,122	1.53	1073.9	1073.9	1074.8	0.9
C	375.39	11,890	85,856	1.51	1075.6	1075.6	1076.3	0.7
D	376.24	13,040	90,479	1.44	1076.4	1076.4	1077.1	0.7
E	376.78	13,870	80,763	1.61	1077.0	1077.0	1077.6	0.6
F	377.54	15,820	78,502	1.66	1078.1	1078.1	1078.6	0.5
G	380.16	16,160	97,304	1.34	1080.4	1080.4	1081.0	0.6
H	380.61	15,980	83,443	1.56	1080.9	1080.9	1081.4	0.5
I	381.38	16,190	95,387	1.36	1081.8	1081.8	1082.4	0.6
J	382.62	15,800	88,709	1.47	1082.9	1082.9	1083.6	0.7
K	383.93	4450	26,810	3.11	1085.2	1085.2	1086.2	1.0
L	385.03	4500	40,148	2.08	1087.5	1087.5	1088.5	1.0
M	385.67	4600	42,181	1.98	1088.2	1088.2	1089.2	1.0
N	386.08	4400	36,421	2.29	1088.7	1088.7	1089.7	1.0
O	386.76	4400	36,475	2.29	1089.8	1089.8	1090.7	0.9
P	387.09	4400	37,975	2.20	1090.4	1090.4	1091.2	0.8
Q	387.72	4350	35,781	2.33	1091.4	1091.4	1092.2	0.8
R	388.21	4350	29,288	2.85	1092.5	1092.5	1093.2	0.7
S	388.26	4800	32,771	2.55	1092.6	1092.6	1093 3	0.7
T	388.56	4500	34,149	2.45	1093.3	1093.3	1093.9	0.6
U	389.37	4700	28,866	2.89	1095.1	1095.1	1095.8	0.7
V	390.05	4700	36,586	2.28	1096.6	1096.6	1097.5	0.9
W	390.16	3400	34,044	2.45	1100.0	1100 0	1100.5	0.5
X	391.13	5600	41,076	2.03	1100.9	1100.9	1101.9	1.0
Y	391.83	6150	41,055	2.03	1102.0	1102.0	1103.0	1.0
Z	392.23	6290	44,026	1.90	1102.7	1102.7	1103.7	1.0

[1]MILES ABOVE MOUTH

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

FLOODWAY DATA

NEOSHO RIVER

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
NEOSHO RIVER								
AA	392.42	6500	53,028	1.57	1104.0	1104.0	1105.0	1.0
AB	392.97	5700	40,070	2.08	1104.6	1104.6	1105.5	0.9
AC	393.44	5450	38,589	2.16	1105.2	1105.2	1106.2	1.0
AD	394.40	5500	40,066	2.08	1106.5	1106.5	1107.5	1.0
AE	394.54	5350	42,410	1.97	1106.7	1106.7	1107.6	0.9
AF	394.98	6200	33,790	2.47	1107.2	1107.2	1108.1	0.9
AG	395.03	5400	22,600	3.69	1111.0	1111.0	1111.8	0.8
AH	396.28	5680	45,810	1.82	1112.9	1112.9	1113.5	0.6
AI	397.81	6400	46,380	1.80	1113.9	1113.9	1114.8	0.9
AJ	398.33	6410	43,610	1.91	1114.7	1114.7	1115.5	0.8
AK	399.09	5450/4250[2]	51,440	1.62	1115.0	1115.0	1116.0	1.0
AL	399.93	5920	29,300	2.85	1116.6	1116.6	1117.5	0.9
AM	400.70	6540	40,950	2.04	1119.1	1119.1	1119.6	0.5
AN	401.73	6750	50,705	1.65	1122.0	1122.0	1122.6	0.6
AO	401.90	7000	52,753	1.58	1122.2	1122.2	1122.8	0.6
AP	402.25	6040	37,421	2.23	1124.1	1124.1	1124.5	0.4
AQ	402.36	5910	43,410	1.92	1124.3	1124.3	1124.8	0.5
AR	402.51	6400	35,801	2.33	1124.6	1124.6	1125.0	0.4
AS	402.93	7100	37,743	2.21	1125.9	1125.9	1126.1	0.2
AT	404.48	7750	50,608	1.65	1128.3	1128.3	1128.9	0.6
AU	404.90	7350	53,818	1.55	1128.7	1128.7	1129.4	0.7
AV	405.14	7350	37,725	1.26	1128.9	1128.9	1129.6	0.7
AW	405.81	7200	42,852	1.11	1129.5	1129.5	1130.2	0.7
AX	406.88	6750	32,219	1.47	1130.6	1130.6	1131.4	0.8
AY	407.34	8170	43,029	1.10	1131.1	1131.1	1131.9	0.8
AZ	407.52	8120	42,041	1.13	1131.3	1131.3	1132.1	0.8

[1]MILES ABOVE MOUTH
[2]TOTAL WIDTH / WIDTH WITHIN UNINCORPORATED AREA

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

FLOODWAY DATA

NEOSHO RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
NEOSHO RIVER								
BA	407.60	8180	35,901	1.32	1131.4	1131.4	1132.2	0.8
BB	408.19	7830	36,927	1.29	1132.1	1132.1	1132.9	0.8
BC	408.63	7500	32,621	1.46	1132.8	1132.8	1133.6	0.8
BD	408.97	6510	32,398	1.47	1133.5	1133.5	1134 3	0.8
BE	409.20	6200	29,444	1.61	1133.9	1133.9	1134 7	0.8
BF	409.46	5400	23,425	2.03	1134.5	1134.5	1135.3	0.8
BG	409.52	5780	21,207	2.19	1136.1	1136.1	1136.5	0.4
BH	411.04	4840	25,675	1.85	1140.2	1140.2	1141.1	0.9
BI	411.41	4600	26,935	1.76	1140.7	1140.7	1141.7	1.0
BJ	411.80	4940	36,084	1.32	1141.2	1141.2	1142.1	0.9
BK	412.38	5060	34,657	1.37	1141.7	1141.7	1142 6	0.9
BL	412.70	4950	27,919	1.70	1142.1	1142.1	1142.9	0.8
BM	413.19	5490	30,316	1.57	1142.9	1142.9	1143.6	0.7
BN	413.40	5010	26,218	1.81	1143.3	1143.3	1143.9	0.6
BO	413.55	5060	26,450	1.80	1143.6	1143.6	1144.2	0.6
BP	413.80	4250	18,328	2.59	1144.3	1144.3	1144 9	0.6
BQ	414.08	4110	22,993	2.07	1145.3	1145.3	1145.9	0.6
BR	414.37	3000	19,712	2.41	1145.9	1145.9	1146.5	0.6
BS	414.65	2700	13,053	3.64	1146.8	1146.8	1147.5	0.7
BT	415.03	3100	14,901	3.19	1148.9	1148.9	1149.4	0.5
BU	415.39	3940	19,438	2.44	1150.7	1150.7	1151.2	0.5
BV	415.69	3500	18,593	2.55	1151.5	1151.5	1152.2	0.7
BW	416.41	5900	36,110	1.32	1152.7	1152.7	1153.3	0.6
BX	416.47	4520	41,998	1.13	1153.9	1153.9	1154.0	0.1
BY	416.75	4050	31,996	1.48	1154.0	1154.0	1154.1	0.1

[1]MILES ABOVE MOUTH

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

FLOODWAY DATA

NEOSHO RIVER

BEST DOCUMENT AVAILABLE

BEST DOCUMENT AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
COTTONWOOD RIVER								
A	0.52	9600	51,729	2.03	1084.7	1084.7	1085.6	0.9
B	3.49	10,750	91,642	1.15	1090.7	1090.7	1091.7	1.0
C	4.57	11,191	109,464	0.96	1091.4	1091.4	1092.4	1.0
D	5.50	7493	68,432	1.53	1092.2	1092.2	1093.2	1.0
E	6.16	5210	38,937	2.70	1093.9	1093.9	1094.9	1.0
F	6.91	5541	54,456	1.93	1096.1	1096.1	1097.1	1.0
G	7.42	4750	44,446	2.36	1097.2	1097.2	1098.2	1.0
H	7.54	5320	48,522	2.16	1097.5	1097.5	1098.5	1.0
I	8.53	4916	50,663	2.07	1099.7	1099.7	1100.5	0.8
J	9.10	4860	49,214	2.13	1100.8	1100.8	1101.6	0.8
K	9.98	6400	53,853	1.95	1102.6	1102.6	1103.3	0.7
L	11.41	7450	81,602	1.29	1104.5	1104.5	1105.1	0.6
M	11.99	6510	66,583	1.58	1105.1	1105.1	1105.7	0.6
N	12.40	6890	43,003	2.44	1106.0	1106.0	1106.7	0.7
O	12.54	6900	72,827	1.44	1106.7	1106.7	1107.3	0.6
P	12.75	7250	74,300	1.41	1106.7	1106.7	1107.7	1.0
Q	13.26	8450[2]	72,140	1.46	1107.0	1107.0	1108.0	1.0
R	14.21	12,540[3]	71,190	1.48	1107.6	1107.6	1108.5	0.9
S	15.29	11,350	63,100	1.66	1108.3	1108.3	1109.2	0.9
T	15.62	8430	46,510	2.26	1108.7	1108.7	1109.6	0.9
U	16.28	7390	57,670	1.82	1110.1	1110.1	1110.9	0.8
V	17.18	7215	42,718	2.46	1110.5	1110.5	1111.5	1.0
W	18.34	8459	62,604	1.68	1113.2	1113.2	1114.2	1.0
X	19.55	9555	77,801	1.33	1114.8	1114.8	1115.8	1.0
Y	20.52	10,308	89,332	1.18	1115.7	1115.7	1116.7	1.0
Z	21.58	9477	72,312	1.45	1116.9	1116.9	1117.9	1.0

[1]MILES ABOVE MOUTH
[2]WIDTH WITHIN UNINCORPORATED AREA IS 8350
[3]WIDTH WITHIN UNINCORPORATED AREA IS 12,040

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

FLOODWAY DATA

COTTONWOOD RIVER

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
COTTONWOOD RIVER								
AA	22.73	8334	58,238	1.80	1119.1	1119.1	1120.1	1.0
AB	24.03	9269	74,896	1.40	1121.4	1121.4	1122.4	1.0
AC	25.49	9216	96,676	1.09	1122.6	1122.6	1123.6	1.0
ALLEN CREEK								
A	3050[2]	2000	10,956	1.55	1124.2	1124.2[3]	1124.6	0.4
B	5750[2]	2000	19,364	1.64	1124.8	1124.6[3]	1125.5	0.9
C	8600[2]	2000	9748	1.74	1125.8	1125.6[3]	1126.6	1.0
D	10,500[2]	1900	9325	1.82	1128.3	1126.4[3]	1127.4	1.0
E	15,650[2]	2200	11,813	1.44	1128.6	1128.2[3]	1129.1	0.9
F	16,650[2]	2500	12,218	1.39	1128.7	1128.4[3]	1129.4	1.0
G	19,350[2]	2400	7469	2.28	1129.9	1129.9	1130.9	1.0
H	20,250[2]	2000	6086	2.79	1131.3	1131 3	1132.2	0.9
I	21,700[2]	2100	9648	1.76	1133.0	1133.0	1133 7	0.7
J	22,700[2]	1500	5696	2.98	1134.0	1134.0	1134.5	0.5
K	25,100[2]	1400	5531	3.07	1137.6	1137.6	1138.3	0.7

[1]MILES ABOVE MOUTH
[2]FEET ABOVE KANSAS TURNPIKE
[3]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM NEOSHO RIVER

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

FLOODWAY DATA

COTTONWOOD RIVER - ALLEN CREEK

BEST DOCUMENT AVAILABLE

BEST DOCUMENT AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
PESTER CREEK								
A	2800	1000	3684	1.76	1134.5	1132.6[2]	1133 6	1.0
B	4400	1000	3405	1.90	1134.7	1134.1[2]	1134.5	0.4
C	5800	1300	4651	1.18	1134.9	1134.6[2]	1135.1	0.5
D	7000	1500	3518	1.55	1135.1	1034.9[2]	1135.5	0.6
E	7780	1600	4824	1.13	1135.4	1135.2[2]	1135.9	0.7
F	7880	1700	5034	1.09	1136.1	1135.3[2]	1136.3	1.0
G	8960	1200	2227	2.46	1141.0	1136.6[2]	1137.1	0.5
H	10,960	1000	2546	1.71	1141.7	1139.6[2]	1139.9	0.3
I	12,560	900	2961	1.47	1141.9	1140.1[2]	1140 8	0.7
J	12,660	940	3268	1.33	1142.0	1140.2[2]	1140.9	0.7
K	22,600	230	1126	3.52	1155.2	1155.2	1156.0	0.8
L	23,600	250	1103	3.59	1156.8	1156.8	1157.6	0.8
M	25,040	788	1449	2.73	1160.1	1160.1	1160.2	0.1
DOW CREEK								
A	6350	3300	9487	1.68	1116.7	1116.7	1117.7	1.0
B	8150	3200	10,782	1.47	1117.9	1117.9	1118.9	1.0
C	11,700	2000	8400	1.89	1119.9	1119.9	1120.9	1.0
D	15,600	1750	7067	2.25	1122.5	1122.5	1123.5	1.0
E	16,650	1050	3916	4.06	1124.1	1124.1	1125.0	0.9
F	17,800	800	4709	3.38	1126.5	1126.5	1127.2	0.7
G	18,900	800	5558	2.86	1127.5	1127.5	1128.2	0.7
H	19,020	430	3170	5.02	1130.0	1130.0	1130.5	0.5
I	19,500	540	3842	4.14	1130.3	1130.3	1131.3	1.0

[1]FEET ABOVE MOUTH
[2]ELEVATIONS WITHOUT CONSIDERING OVERFLOW EFFECT FROM NEOSHO RIVER

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

FLOODWAY DATA

PESTER CREEK - DOW CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
DRY CREEK								
A	2000	800	6399	1.66	1074.8	1072.3[2]	1073.3	1.0
B	2670	1100	8355	1.27	1074.8	1072.5[2]	1073.5	1.0
C	4590	1025	7544	1.41	1074.8	1072.8[2]	1073 7	0.9
D	7000	600	3773	2.81	1074.8	1073.5[2]	1074.4	0.9
E	8000	925	5522	1.92	1074.8	1074.2[2]	1075.0	0.8
F	9130	500	3234	3.28	1074.8	1074.7[2]	1075.5	0.8
G	10,340	300	1863	5.69	1076.1	1076.1	1076.8	0.7
H	11,310	900	4088	2.59	1077.8	1077.8	1078.6	0.8
I	13,980	1400	6686	1.59	1079.3	1079.3	1080.2	0.9
J	16,070	1010	8318	1.27	1079.7	1079.7	1080.7	1.0
K	16,830	1200	5530	1.92	1079.9	1079.9	1080.8	0.9
L	18,030	900	5063	2.09	1080.5	1080.5	1081.4	0.9
M	18,800	525	2499	4.24	1081.1	1081.1	1082.0	0.9
N	19,630	800	4729	2.24	1082.2	1082.2	1083.2	1.0
O	20,000	950	4745	2.23	1082.5	1082.5	1083.5	1.0
P	20,430	900	3619	2.93	1082.9	1082.9	1083.8	0.9
Q	20,610	850	1871	5.67	1083.0	1083.0	1083.8	0.8
R	21,140	800	3525	3.01	1085.4	1085.4	1086.4	1.0
S	22,290	550	2796	3.79	1087.6	1087.6	1088.1	0.5
T	23,060	600	3588	2.95	1088.5	1088.5	1089.2	0.7
U	23,790	600	2971	3.57	1089.2	1089.2	1090.0	0.8
V	24,470	500	2513	4.22	1090.6	1090.6	1091.2	0.6
W	25,230	600	3929	2.70	1091.7	1091.7	1092.4	0.7
X	25,410	700	4618	2.30	1094.8	1094 8	1095 7	0.9

[1]FEET ABOVE MOUTH
[2]ELEVATIONS WITHOUT CONSIDERING BACKWATER EFFECT FROM NEOSHO RIVER

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

FLOODWAY DATA

DRY CREEK

BEST DOCUMENT AVAILABLE

BEST DOCUMENT AVAILABLE

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
EAGLE CREEK								
A	0	390	3056	3.3	1157.3	1157.3	1158.3	1.0
B	960	550	3443	3.0	1158.5	1158.5	1159.2	0.7
C	3552	650	3444	3.0	1161.3	1161.3	1161.9	0.6
D	5808	600	2945	3.5	1166.3	1166.3	1166.7	0.4
E	6635	600	3866	2.6	1166.9	1166.9	1167.6	0.7
F	7755	500	2807	3.6	1168.1	1168.1	1168.7	0.6
G	9142	750	3965	2.6	1169.9	1169.9	1170.4	0.5
H	10,203	900	4211	2.4	1170.5	1170.5	1171.1	0.6
I	11,490	800	3178	3.2	1171.4	1171.4	1172.1	0.7
J	11,890	640	4547	2.2	1174.3	1174.3	1174.5	0.2
K	13,030	584	3733	2.7	1174.7	1174.7	1175.1	0.4
L	14,587	600	3485	2.9	1175.7	1175.7	1176.2	0.5
M	15,675	292	2035	5.0	1176.7	1176.7	1177.2	0.5
N	15,782	104	1227	8.3	1176.7	1176.7	1177.2	0.5
O	16,070	865	5264	1.9	1178.1	1178.1	1178.4	0.3
P	17,046	750	5224	2.0	1178.5	1178.5	1178.8	0.3
Q	17,579	780	3908	2.6	1178.7	1178.7	1179.0	0.3
R	19,072	600	3146	3.2	1180.2	1180.2	1180.4	0.2
S	20,059	700	3270	3.1	1181.3	1181.3	1181.7	0.4
T	20,139	700	3005	3.4	1181.5	1181.5	1181.8	0.3
U	20,672	600	3259	3.1	1181.7	1181.7	1182.4	0.7
V	21,520	400	2690	3.8	1182.7	1182.7	1183.3	0.6
W	22,635	550	3597	2.8	1183.7	1183.7	1184.5	0.8
X	23,862	400	2118	4.4	1185.2	1185.2	1186.0	0.8
Y	25,270	400	3081	3.0	1187.6	1187.6	1187.9	0.3
Z	25,382	340	3428	2.7	1189.9	1189.9	1189.9	0.0

[1]FEET ABOVE LIMIT OF DETAILED STUDY 11,500 FEET DOWNSTREAM FROM HIGHWAY 99

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

FLOODWAY DATA

EAGLE CREEK

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQ. FEET)	MEAN VELOCITY (FEET/SEC.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
EAGLE CREEK								
AA	26,102	500	4186	2.2	1190.0	1190.0	1190.2	0.2
AB	27,654	750	4498	2.0	1190.3	1190.3	1190.8	0.5
AC	28,667	750	2559	3.6	1191.3	1191.3	1191.8	0.5
AD	29,547	700	4293	2.1	1192.4	1192.4	1193 0	0.6
AE	29,691	600	2818	3.3	1192.6	1192.6	1193.1	0.5
AF	30,352	800	4226	2.2	1193.4	1193.4	1193 8	0.4

[1]FEET ABOVE LIMIT OF DETAILED STUDY 11,500 FEET DOWNSTREAM OF HIGHWAY 99

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

FLOODWAY DATA

EAGLE CREEK

BEST DOCUMENT AVAILABLE

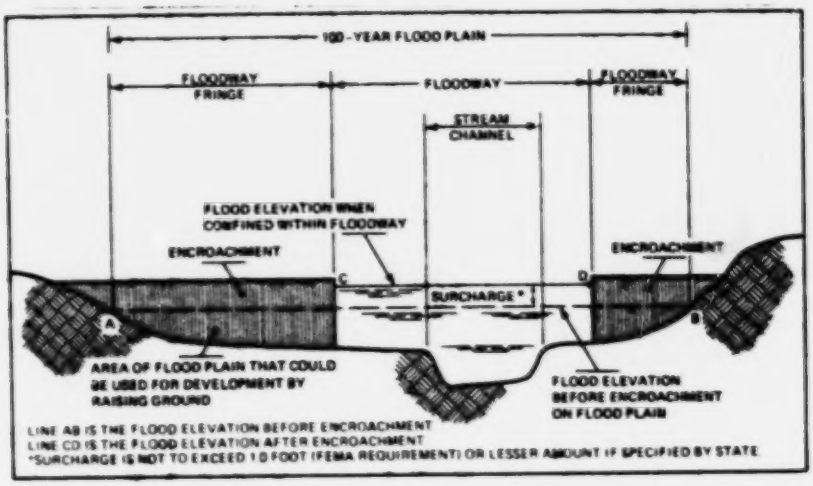
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE *
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE

FIGURE 2 - Floodway Schematic

The floodways in this report are recommended to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, FEMA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHF), and flood insurance zone designations for each flooding source affecting the unincorporated areas of Lyon County.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 per cent of the reach.

Average Difference Between 10- and 100-year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the unincorporated areas of Lyon County are shown on the Flood Profiles and are summarized in Table 4, "Flood Insurance Zone Data."

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5.2 Flood Hazard Factors

The FHF is used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest 0.5 foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire unincorporated areas of Lyon County were divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zone A:	Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations are shown or FHFs determined.
Zones A2-A5, A7-A9:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations are shown, and zones subdivided according to FHF.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; or areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 4, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community.

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FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
NEOSHO RIVER							
REACH 1	0125,0150,0200	–3.9	–1.4	3.0	040	A8	VARIES–SEE MAP
REACH 2	0125,0150	–3.3	–0.8	2.4	035	A7	VARIES–SEE MAP
REACH 3	0125	–1.3	–0.5	1.9	015	A3	VARIES–SEE MAP
REACH 4	0075,0125	–2.3	–0.6	2.2	025	A5	VARIES–SEE MAP
COTTONWOOD RIVER							
REACH 1	0125,0150 0175,0200	–4.4	–1.4	1.9	045	A9	VARIES–SEE MAP
REACH 2	0125,0175	–4.1	–1.3	3.0	040	A8	VARIES–SEE MAP
REACH 3	0125	–4.4	–1.4	3.9	045	A9	VARIES–SEE MAP
ALLEN CREEK							
REACH 1	0125	–2.3	–0.6	2.2	025	A5	VARIES–SEE MAP
REACH 2	0125	–1.9	–0.6	3.7	020	A4	VARIES–SEE MAP
PESTER CREEK							
REACH 1	0075	–1.0	–0.3	0.9	010	A2	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

NEOSHO RIVER - COTTONWOOD RIVER - ALLEN CREEK - PESTER CREEK

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION[3] (NGVD)
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
DOW CREEK							
REACH 1	0125	−1.6	−0.4	1.4	015	A3	VARIES–SEE MAP
DRY CREEK							
REACH 1	0150	−1.7	−0.5	2.1	015	A3	VARIES–SEE MAP
EAGLE CREEK							
REACH 1	0175,0200	−2.2	−0.7	2.2	020	A4	VARIES–SEE MAP
REACH 2	0175	−3.5	−0.9	1.6	035	A7	VARIES–SEE MAP
REACH 3	0175	−1.6	−0.5	1.5	015	A3	VARIES–SEE MAP

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT

TABLE 4

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

FLOOD INSURANCE ZONE DATA

DOW CREEK - DRY CREEK - EAGLE CREEK

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5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the unincorporated areas of Lyon County is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by FEMA.

6.0 OTHER STUDIES

In June 1965, the Tulsa District COE published a Flood Plain Information report for the Neosho River and the Cottonwood River (Reference 9). The profiles shown in this Flood Plain Information report indicate historic floods (1948, 1951 and 1957) as the water-surface elevations that would have occurred if the flood-control dams were in operation at the time of the floods. In February 1977, the Tulsa COE published another Flood Plain Information report for the Neosho River and the Cottonwood River at Emporia, Kansas (Reference 3).

Flood Insurance Studies for the Cities of Emporia and Americus (References 10 and 11) agree exactly with this study.

A Flood Hazard Boundary Map has been published for the community (Reference 8). The differences between the Flood Hazard Boundary Map and this study are justified due to the more detailed nature of this Flood Insurance Study.

This report either supersedes or is compatible with all previous studies published on streams studied in this report and should be considered authoritative for the purposes of the National Flood Insurance Program.

7.0 LOCATION OF DATA

Information concerning the pertinent data used in preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, Federal Emergency Management Agency, 911 Walnut Street, Kansas City, Missouri 64106.

8.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Commerce, Bureau of the Census, 1970 Census of Population, Final Population Count, Kansas, Washington, D.C., 1971.

2. ————, National Oceanic and Atmospheric Administration, Annual Summary, 1933-1975, Climatological Data, Kansas.

3. U.S. Army Corps of Engineers, Tulsa District, Flood Plain Information Grand (Neosho) River and Cottonwood River, Emporia, Kansas, February 1977.

4. Kansas Water Resources Board, Technical Report No. 11, Magnitude and Frequency of Floods in Kansas, P.R. Jordan and T.J. Irza, 1975.

5. Western Air Maps, Inc., Aerial Photography, Scale 1:4800, Contour Interval five feet: Lenexa, Kansas, April 1977.

6. U.S. Geological Survey, Open-File Report 76-499, Computer Applications for Step-Backwater and Floodway Analysis, Computer Program E-431, User's Manual, James O. Shearman, 1976.

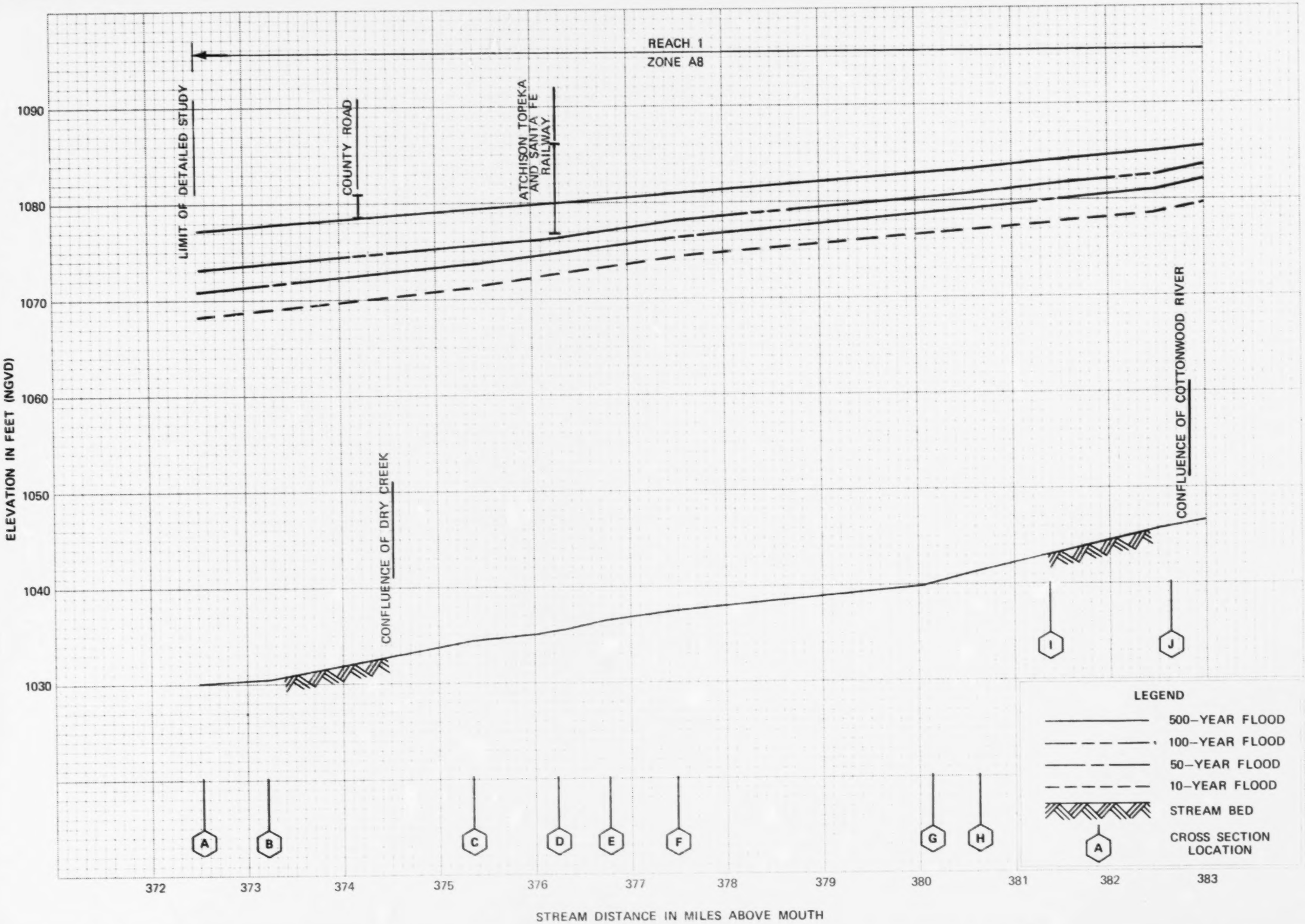
7. ————, Preparation of Input Data for Automatic Computation of Stage-Discharge Relations at Culverts, Howard F. Matthai, Harold E. Still and Jacob Davidian, 1971.

8. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Lyon County, Unincorporated Areas, Kansas, June 1977.

9. U.S. Army Corps of Engineers, Tulsa District, Flood Plain Information Neosho and Cottonwood Rivers, Kansas, June 1965.

10. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Insurance Study, City of Emporia, Kansas, April 1979.

11. Federal Emergency Management Agency, Flood Insurance Study, City of Americus, Kansas, (in progress).



FLOOD PROFILES

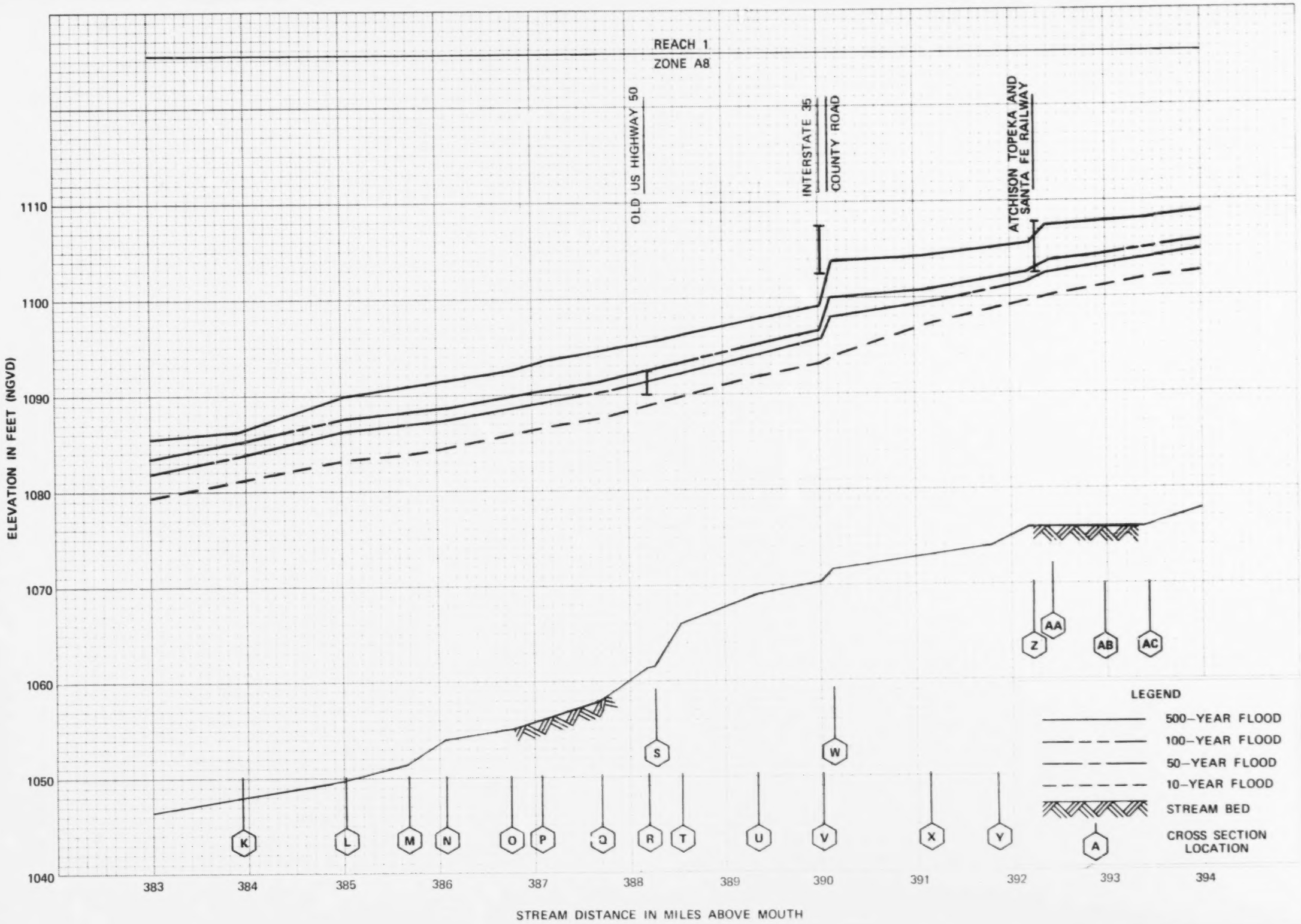
NEOSHO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

01P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

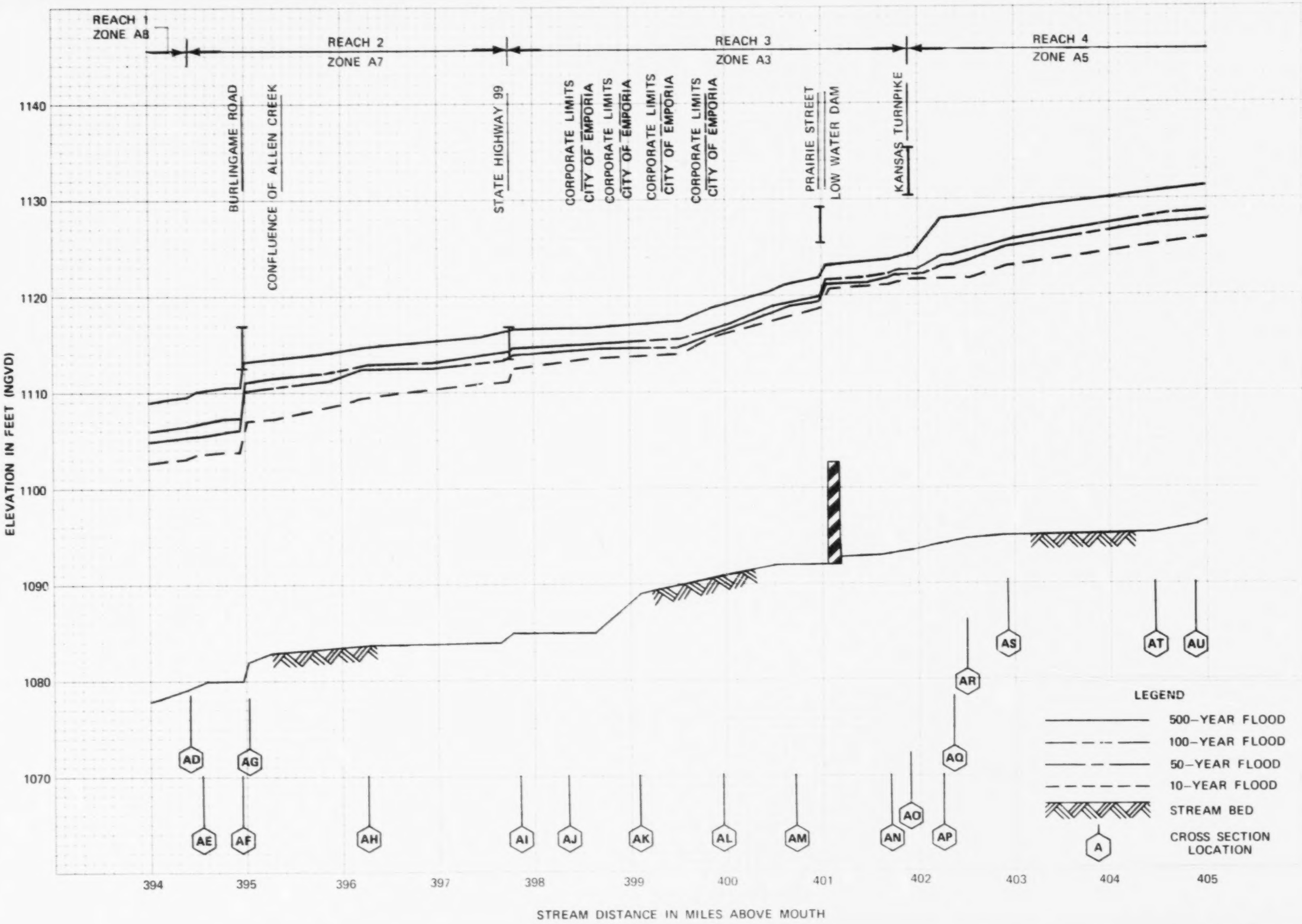
NEOSHO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

02P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

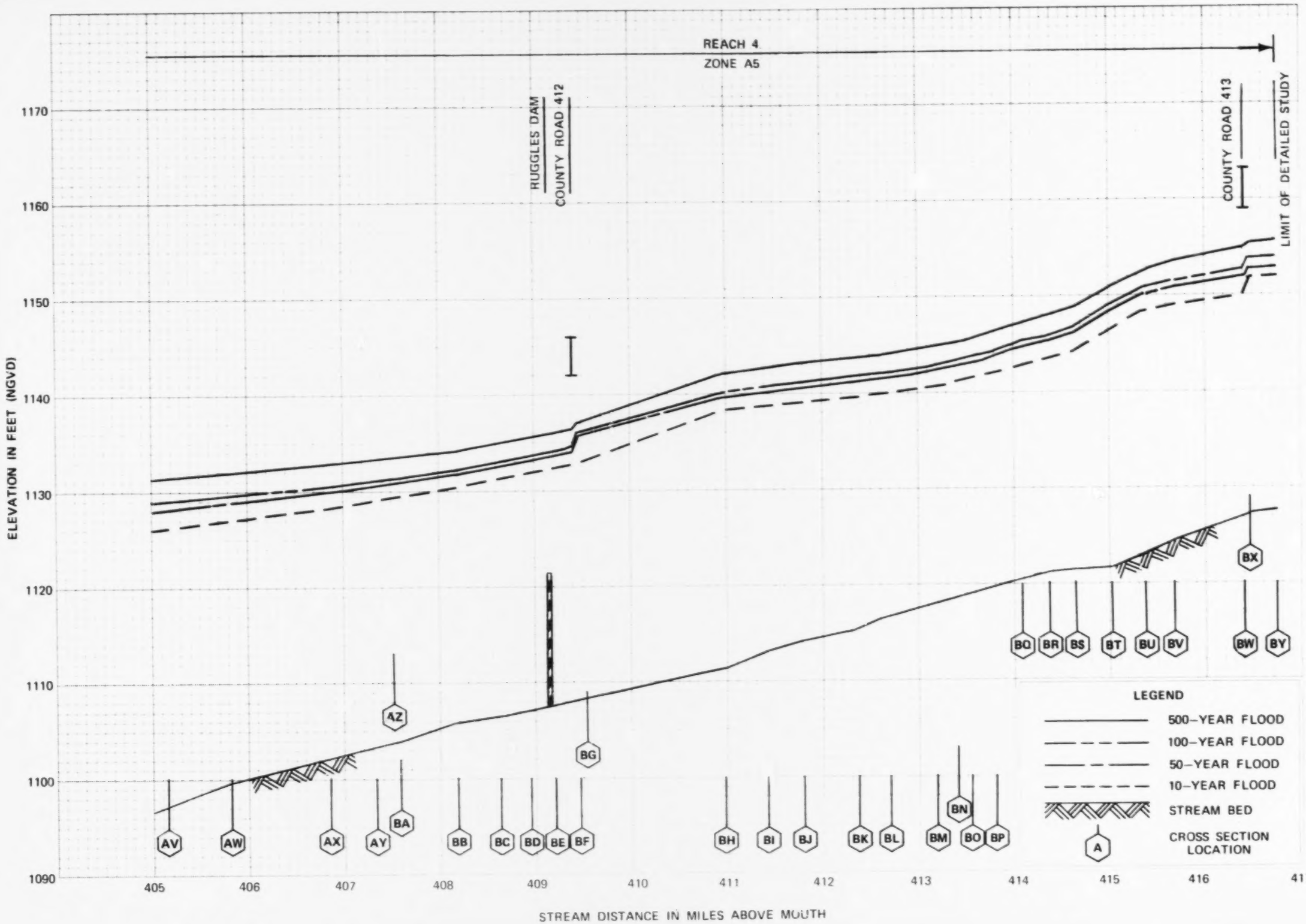
NEOSHO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

03P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

NEOSHO RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

04P

BEST DOCUMENT AVAILABLE

NEOSHO RIVER OVERFLOW
ZONE A8

REACH 1
ZONE A9

MOUTH AT NEOSHO RIVER

ATCHISON TOPEKA AND SANTA FE RAILWAY

COUNTY ROAD

ELEVATION IN FEET (NGVD)

1100
1090
1080
1070
1060
1050
1040

0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5

STREAM DISTANCE IN MILES ABOVE MOUTH

A B C D

LEGEND

- 500–YEAR FLOOD
- 100–YEAR FLOOD
- 50–YEAR FLOOD
- 10–YEAR FLOOD
- STREAM BED
- A — CROSS SECTION LOCATION

FLOOD PROFILES

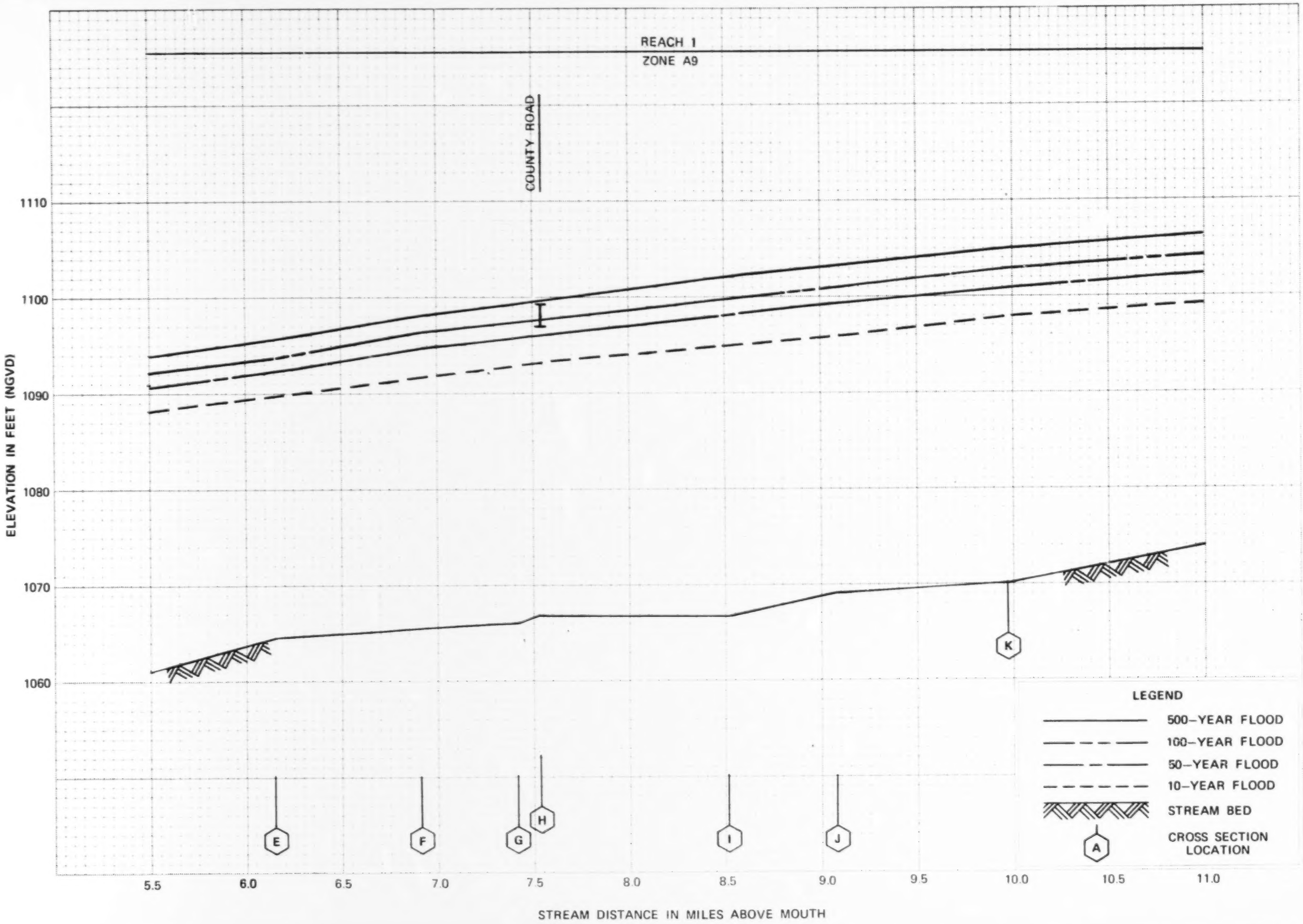
COTTONWOOD RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

05P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

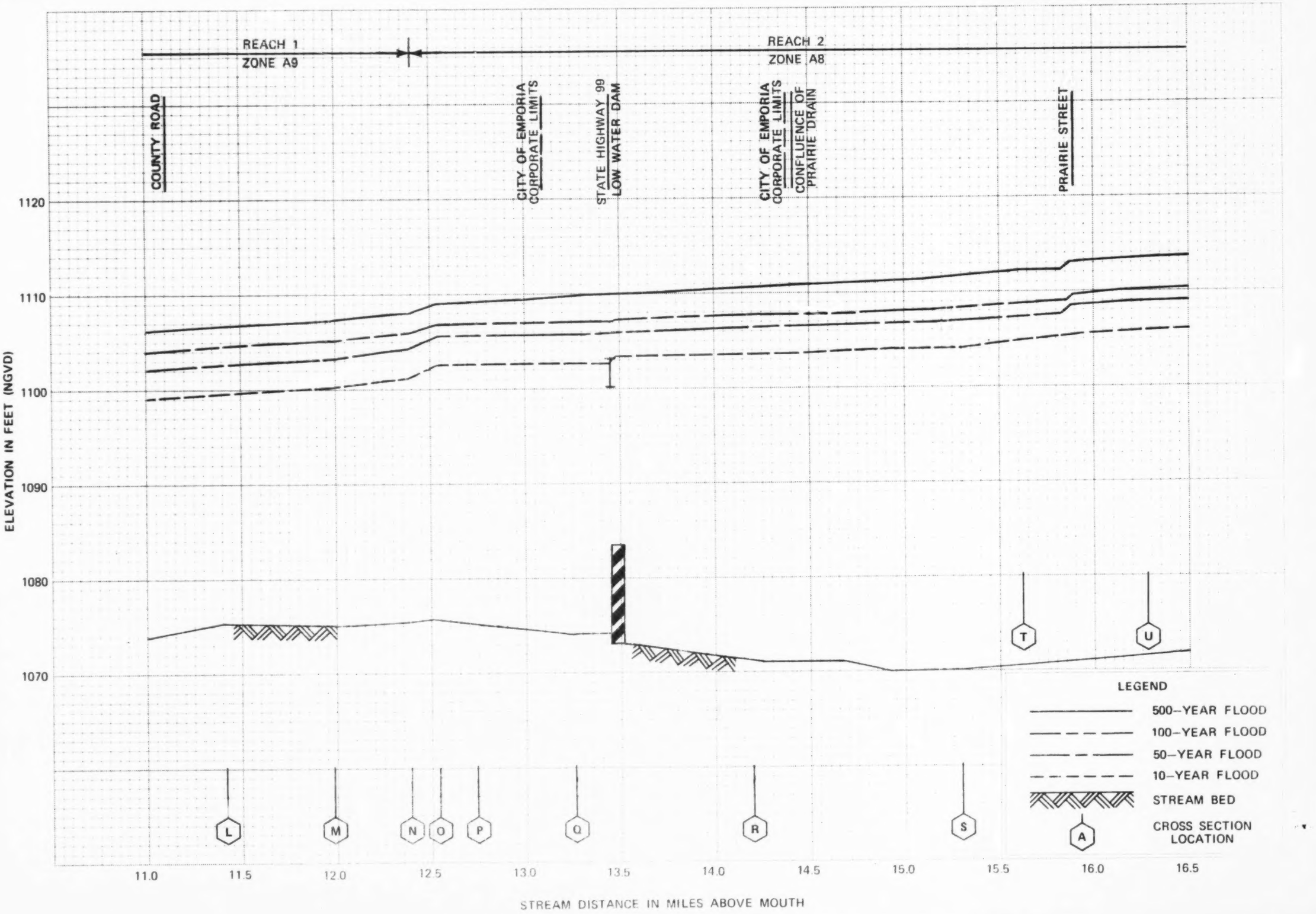
COTTONWOOD RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

06P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

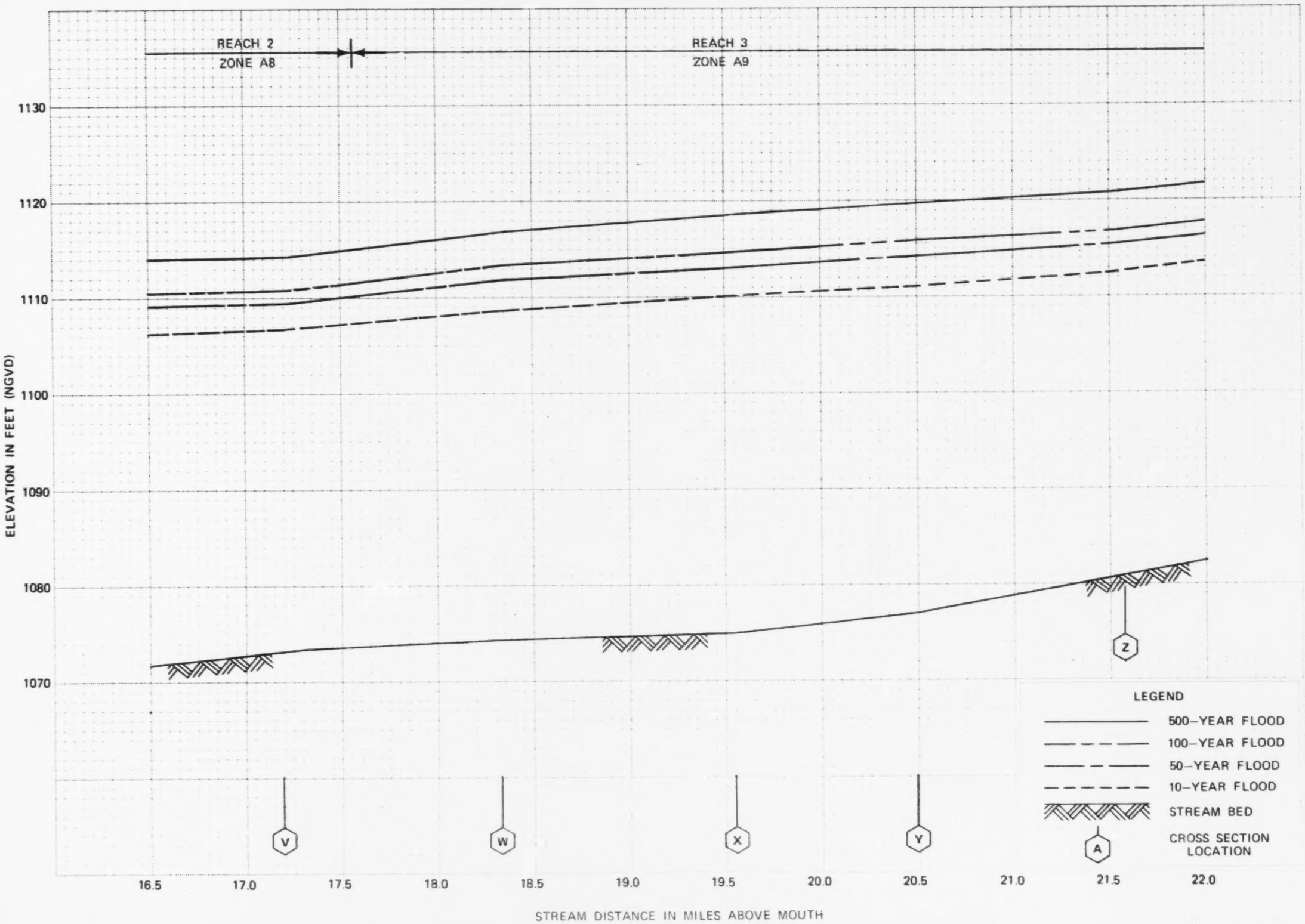
COTTONWOOD RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

07P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

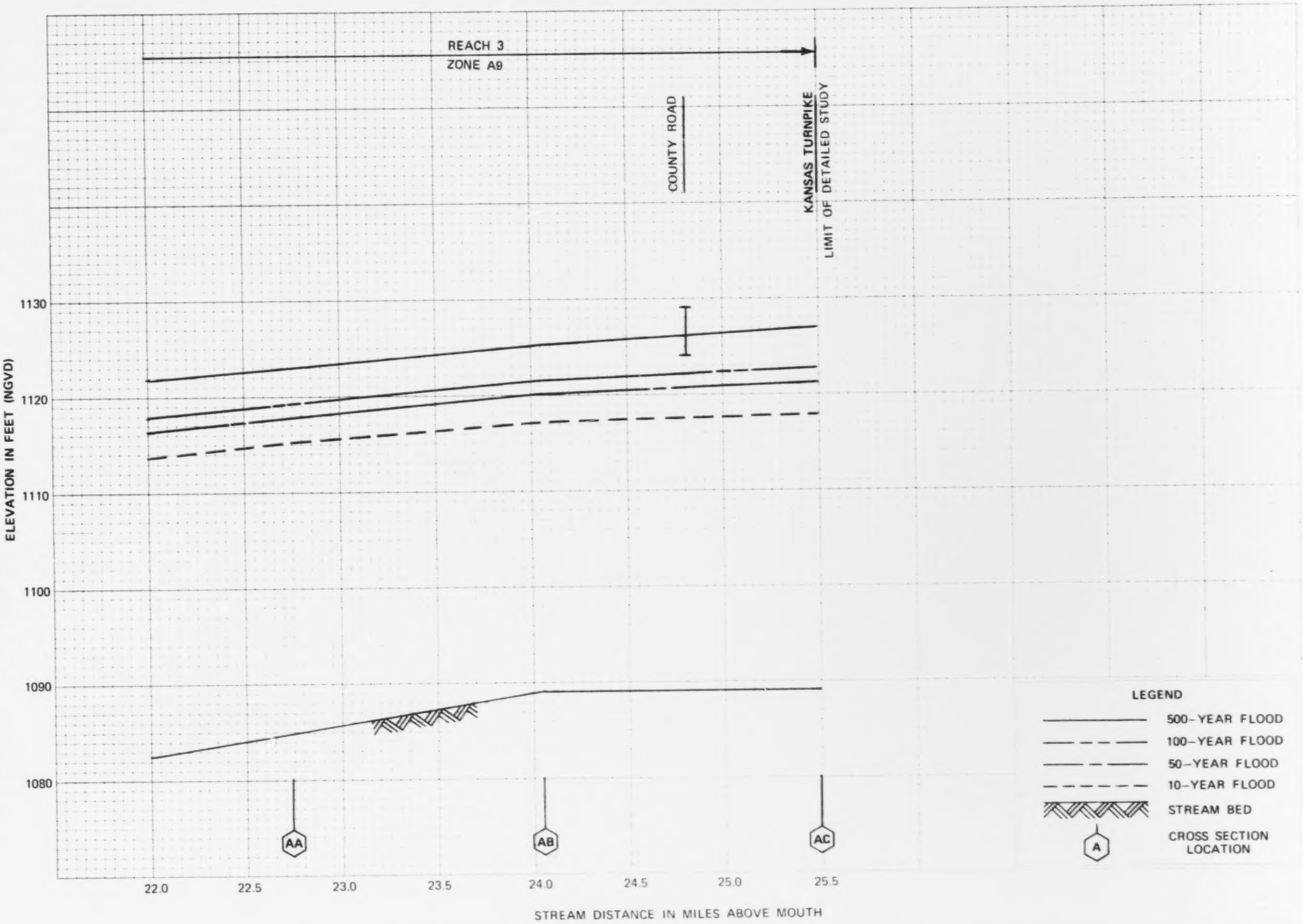
COTTONWOOD RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

08P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

COTTONWOOD RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

09P

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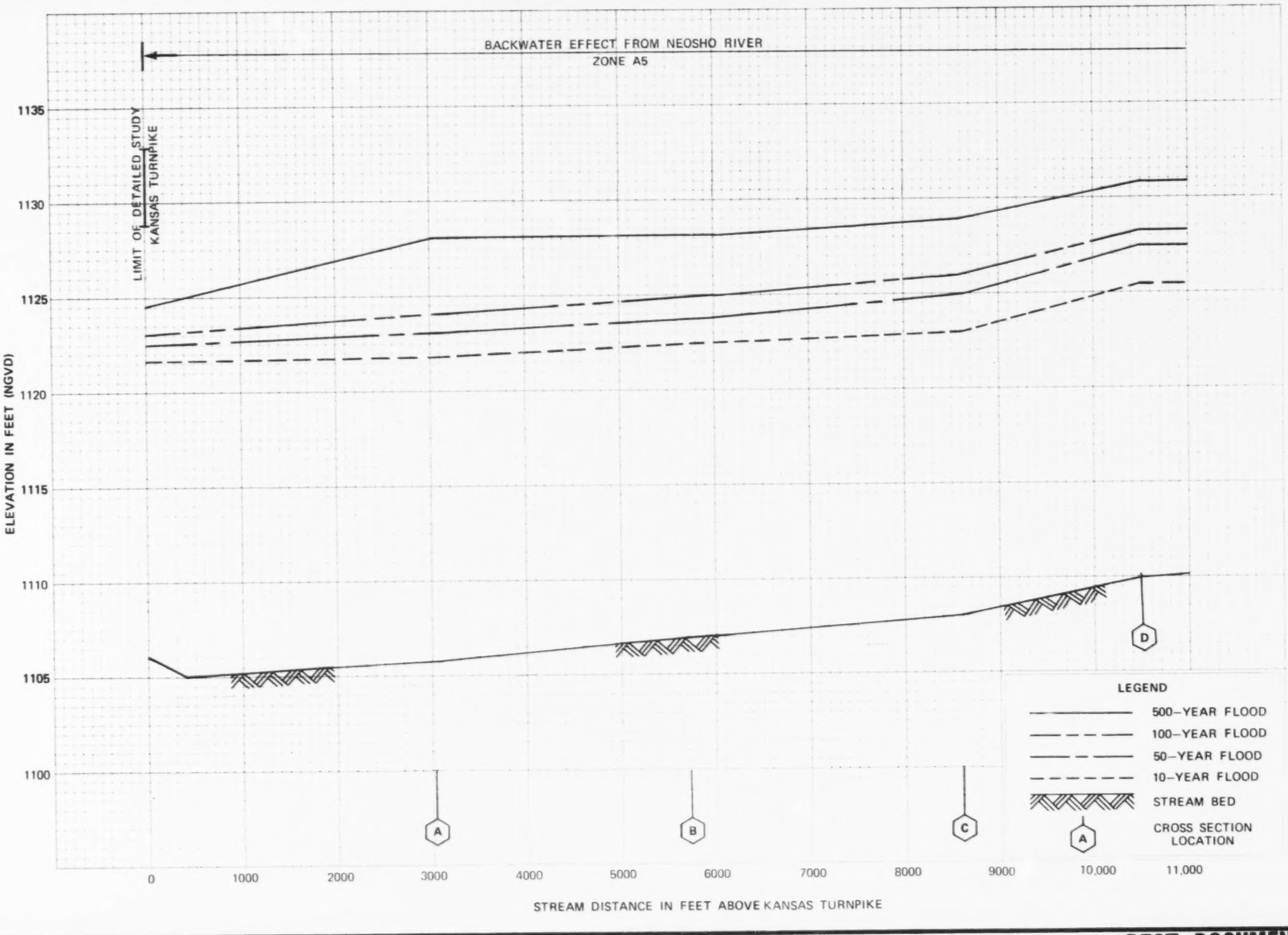


FLOOD PROFILES

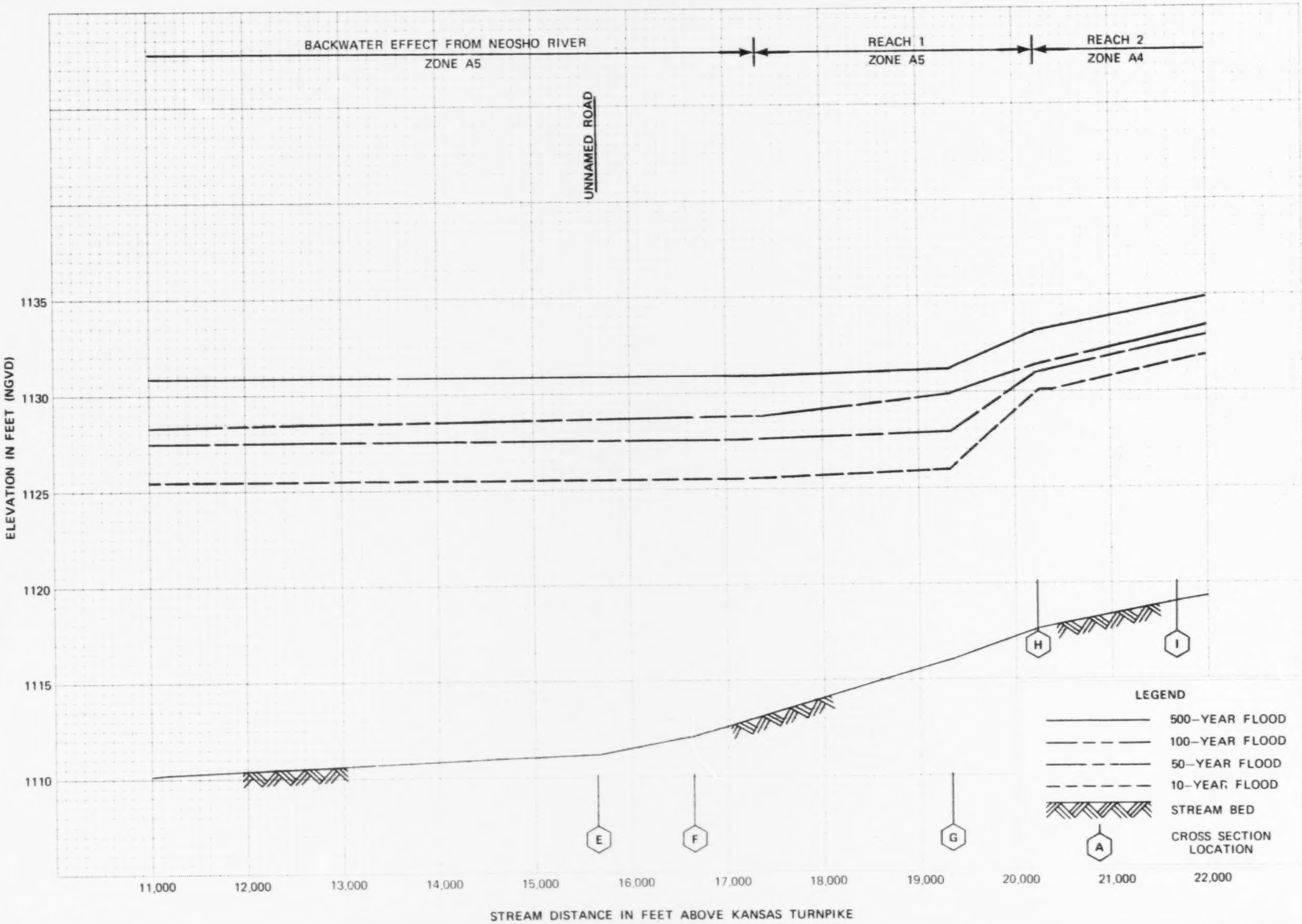
ALLEN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

10P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

ALLEN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

11P

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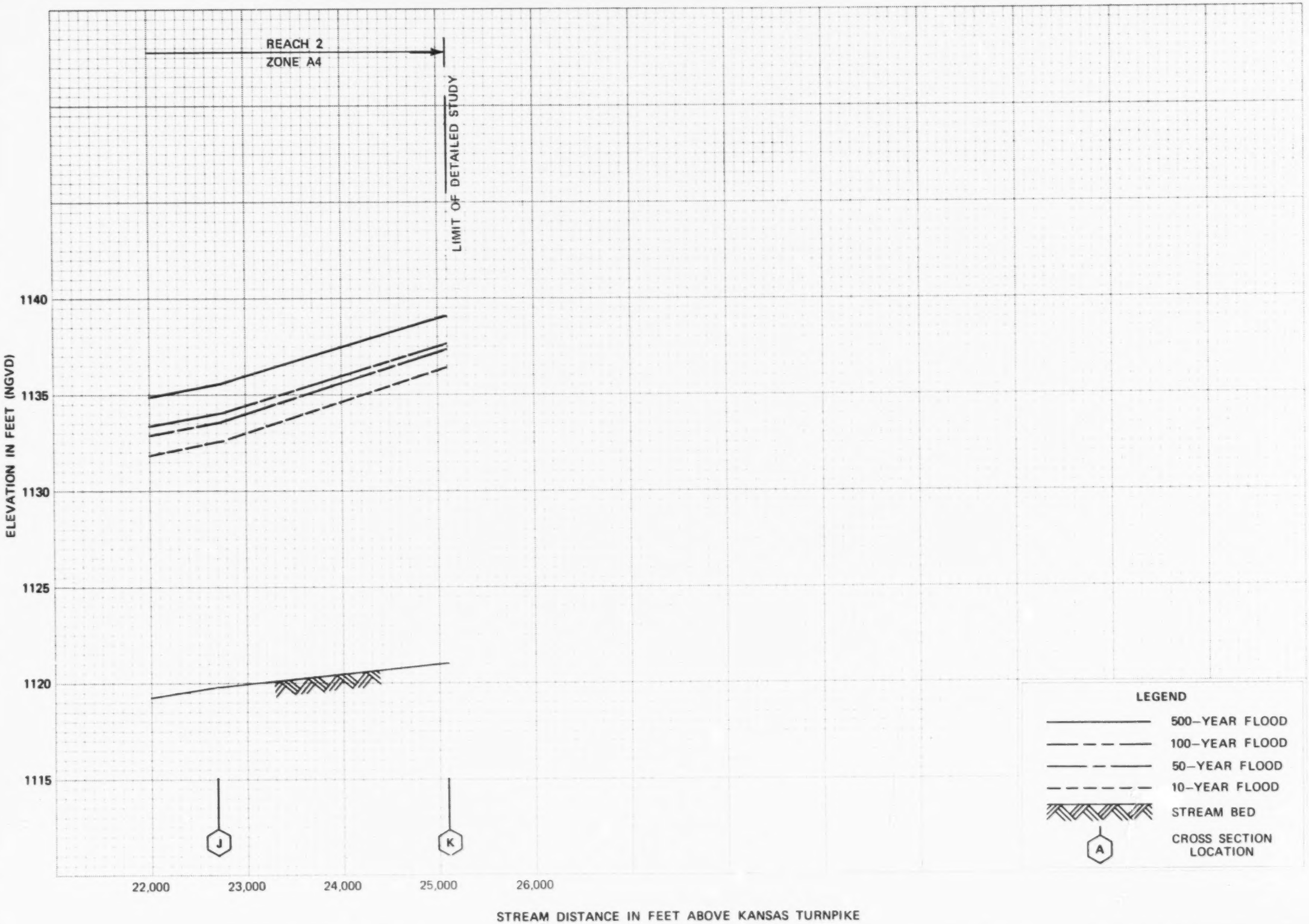

FLOOD PROFILES

ALLEN CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

12P

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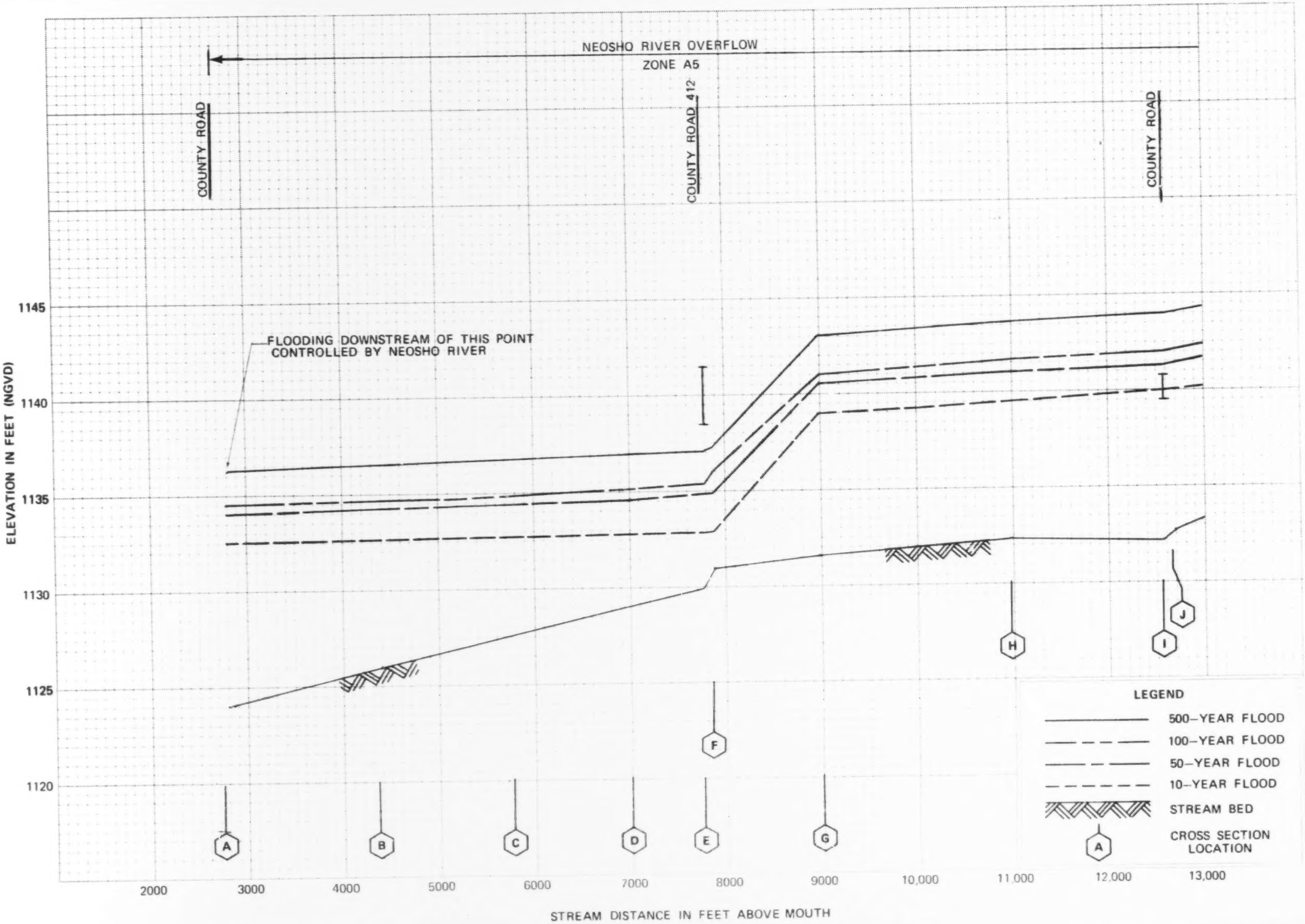

FLOOD PROFILES

PESTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

13P

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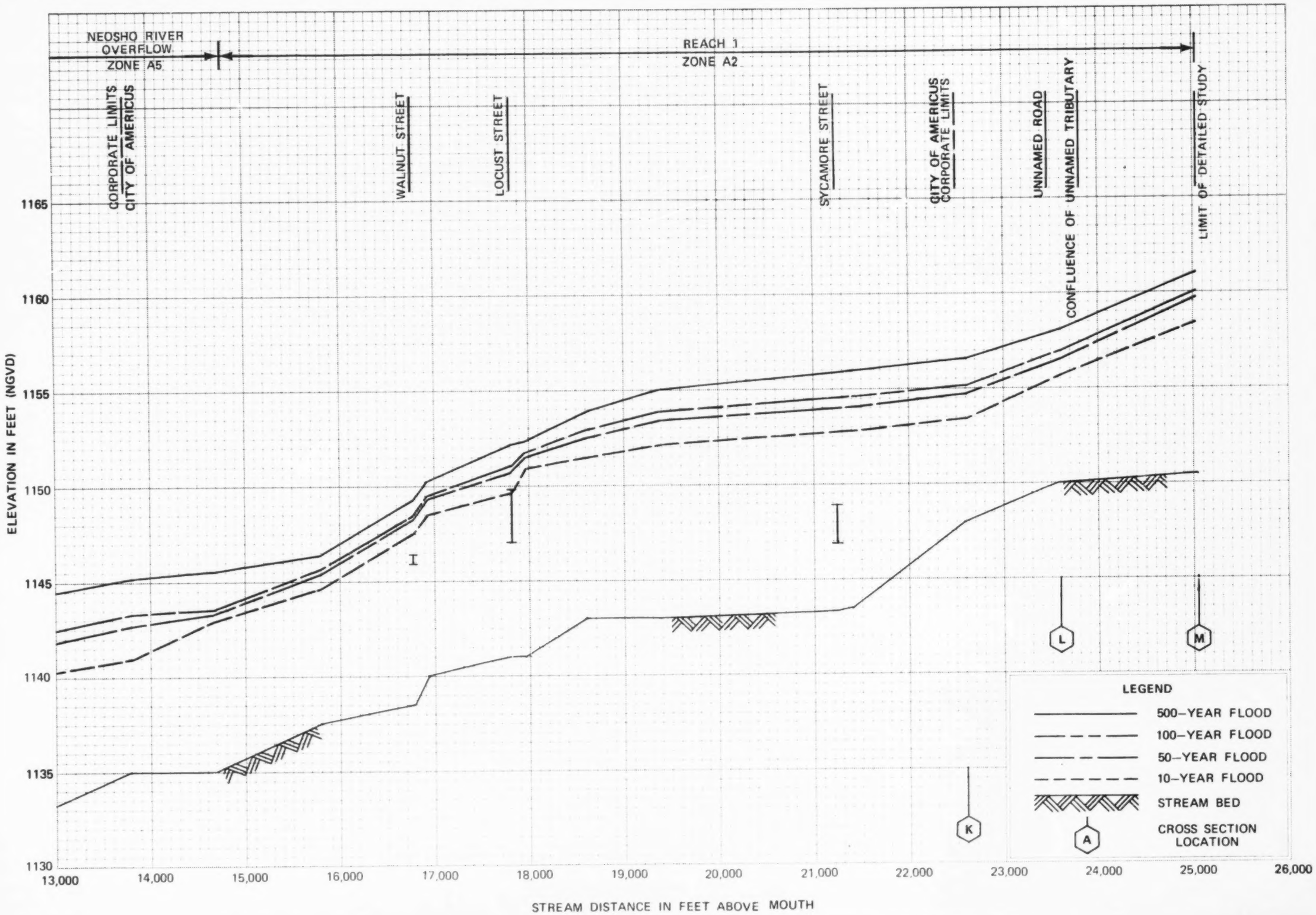

FLOOD PROFILES

PESTER CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

14P

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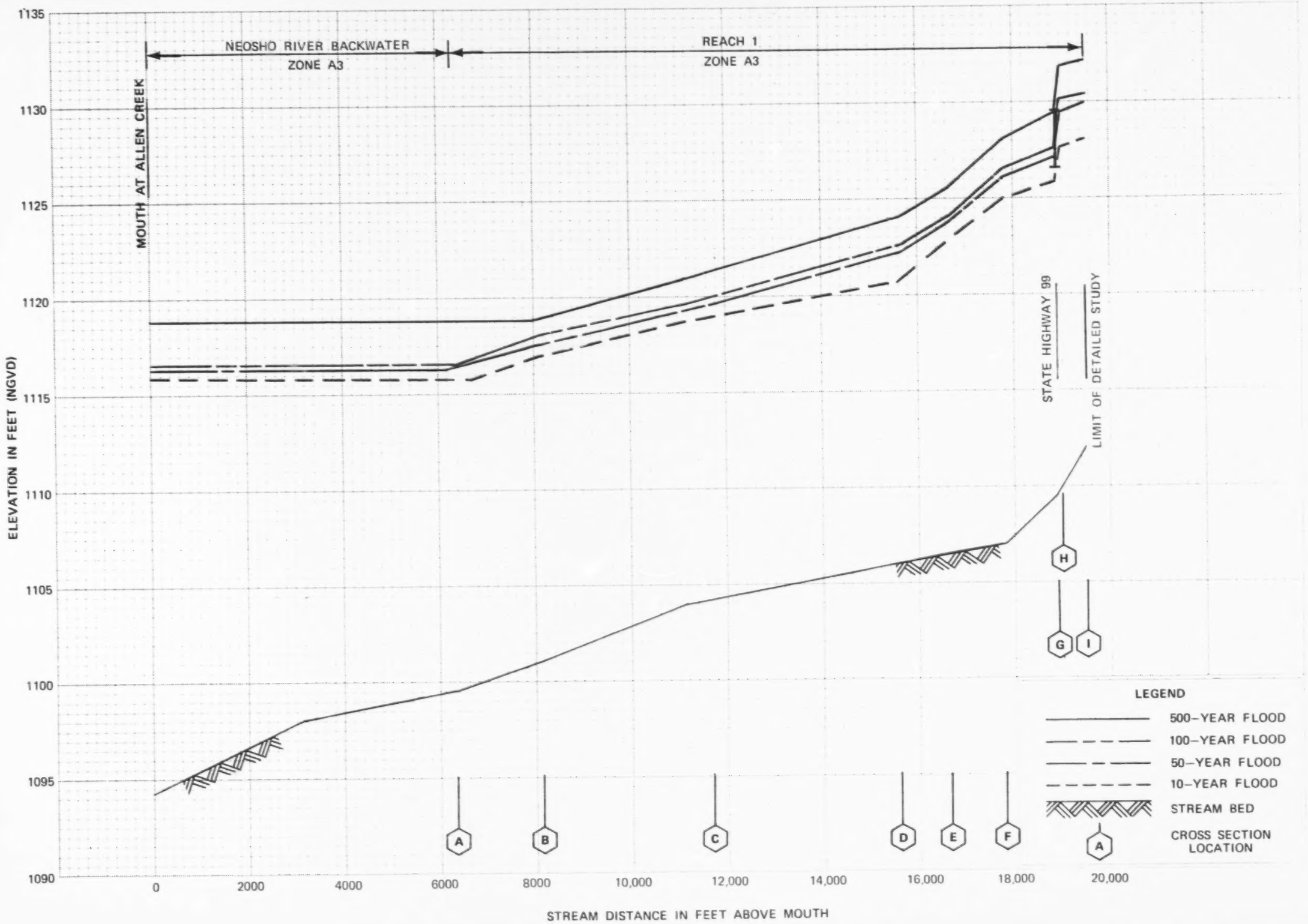

FLOOD PROFILES

DOW CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

15P

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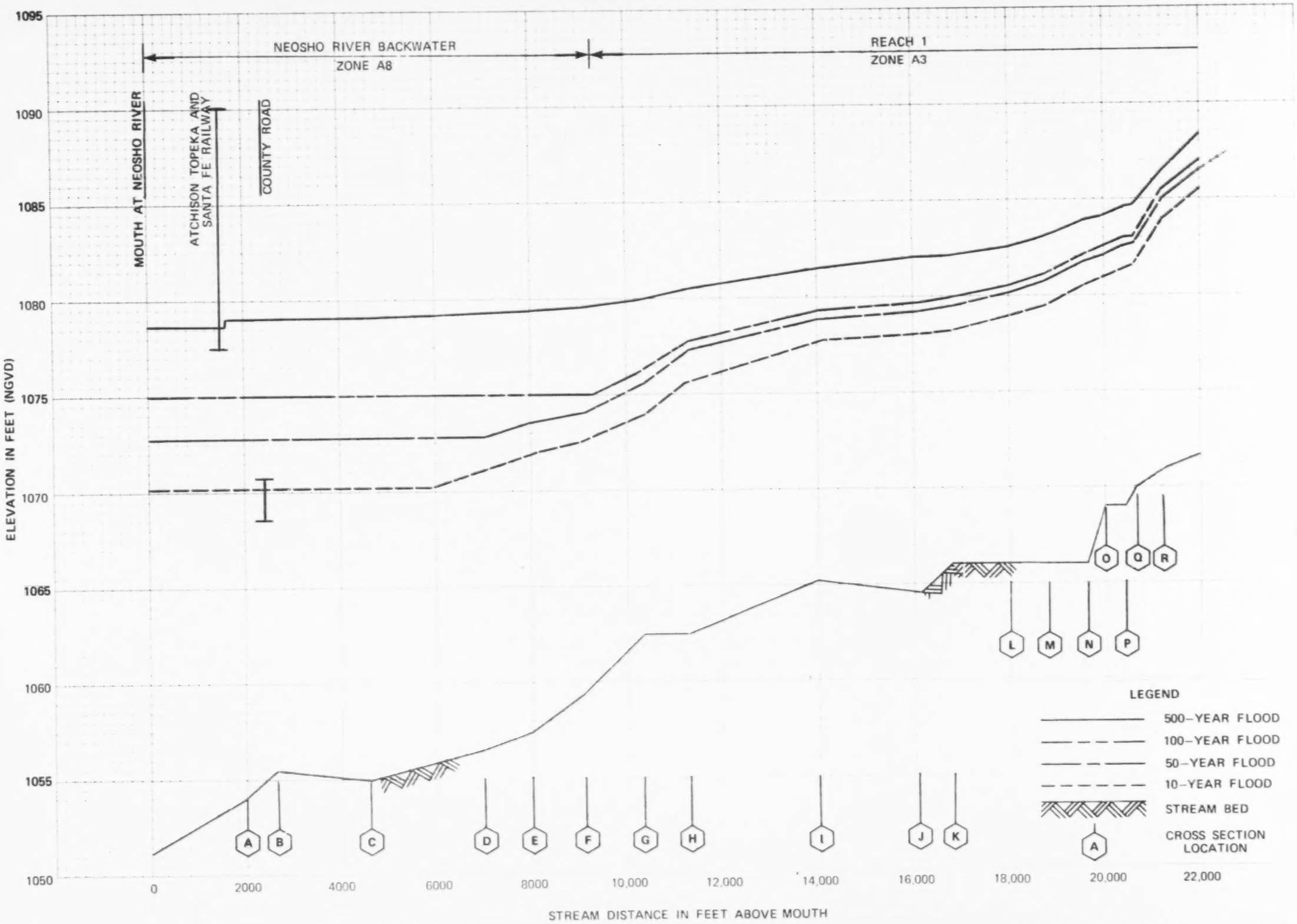

FLOOD PROFILES

DRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

16P

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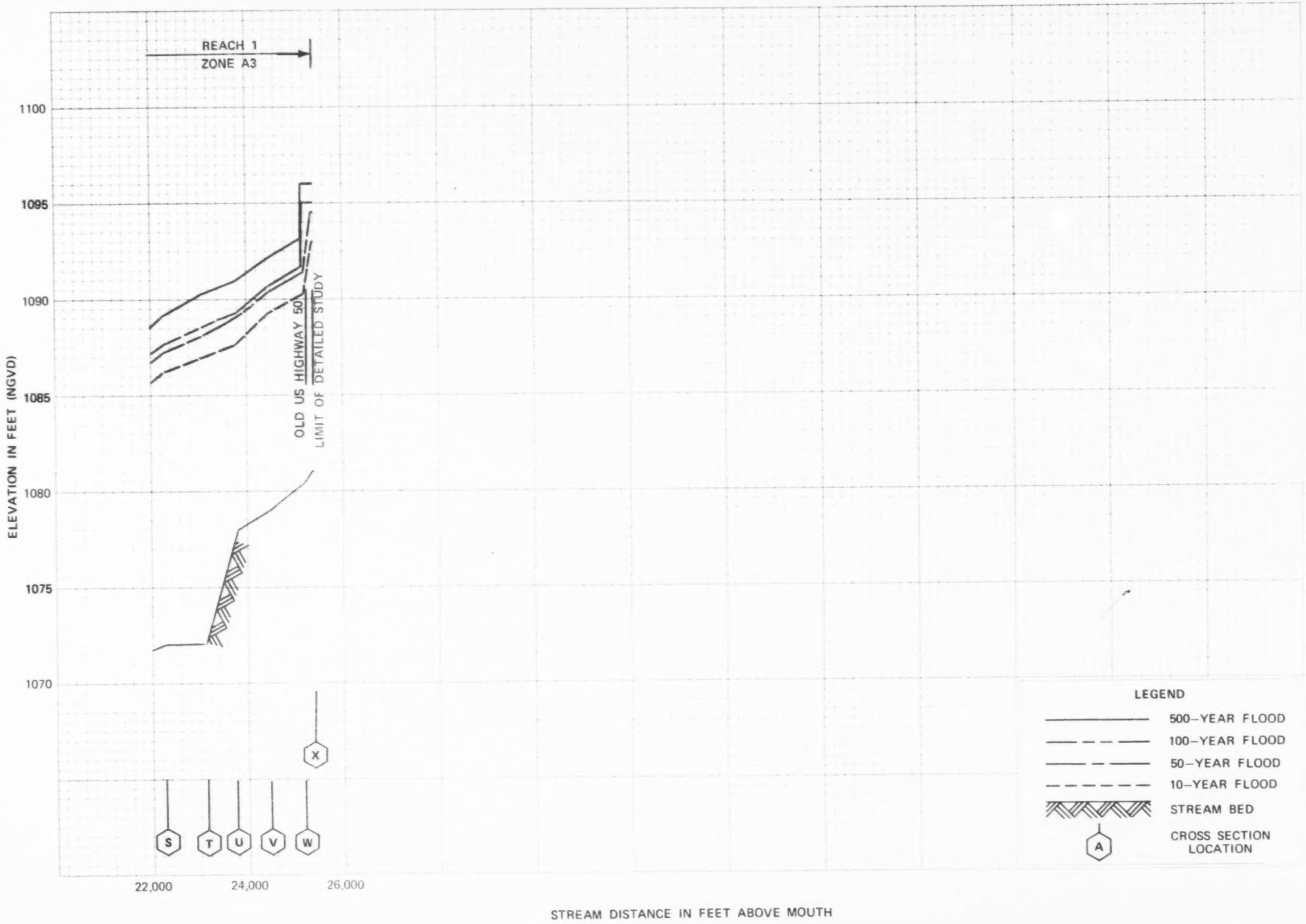

FLOOD PROFILES

DRY CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

17P

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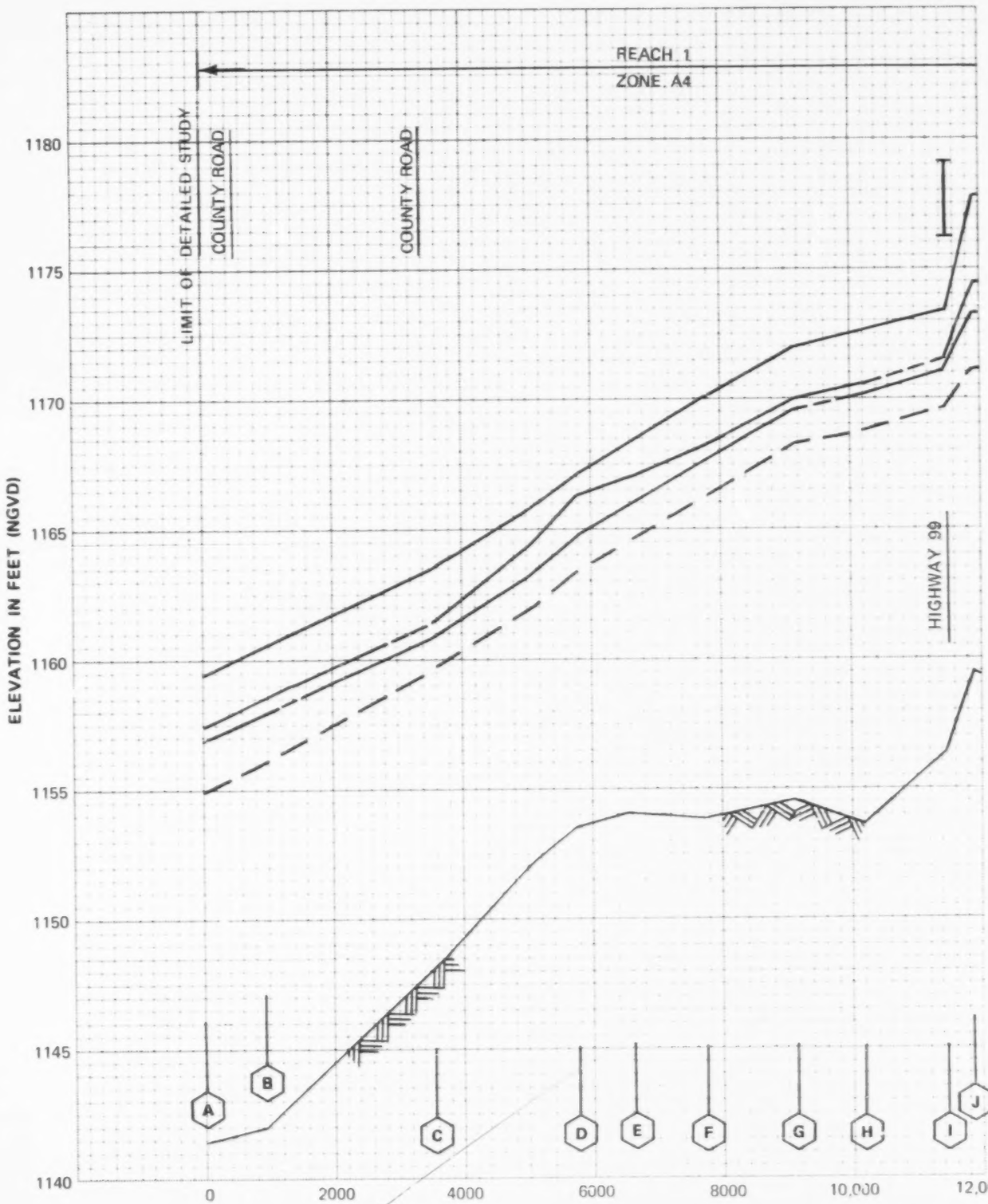
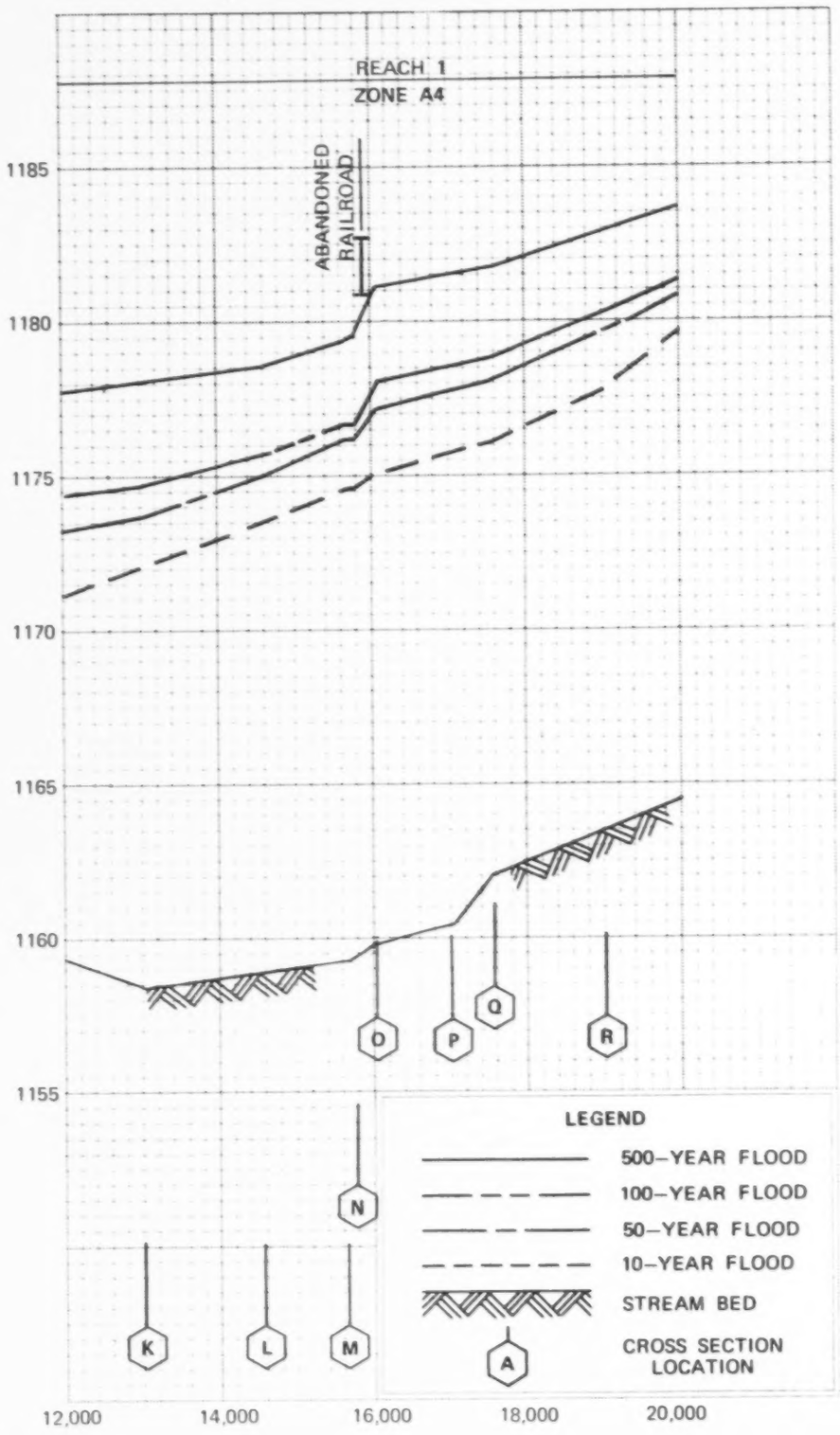




STREAM DISTANCE IN FEET ABOVE LIMIT OF DETAILED STUDY
(LIMIT OF DETAILED STUDY IS 11,500 FEET DOWNSTREAM FROM STATE HIGHWAY 99)

FLOOD PROFILES

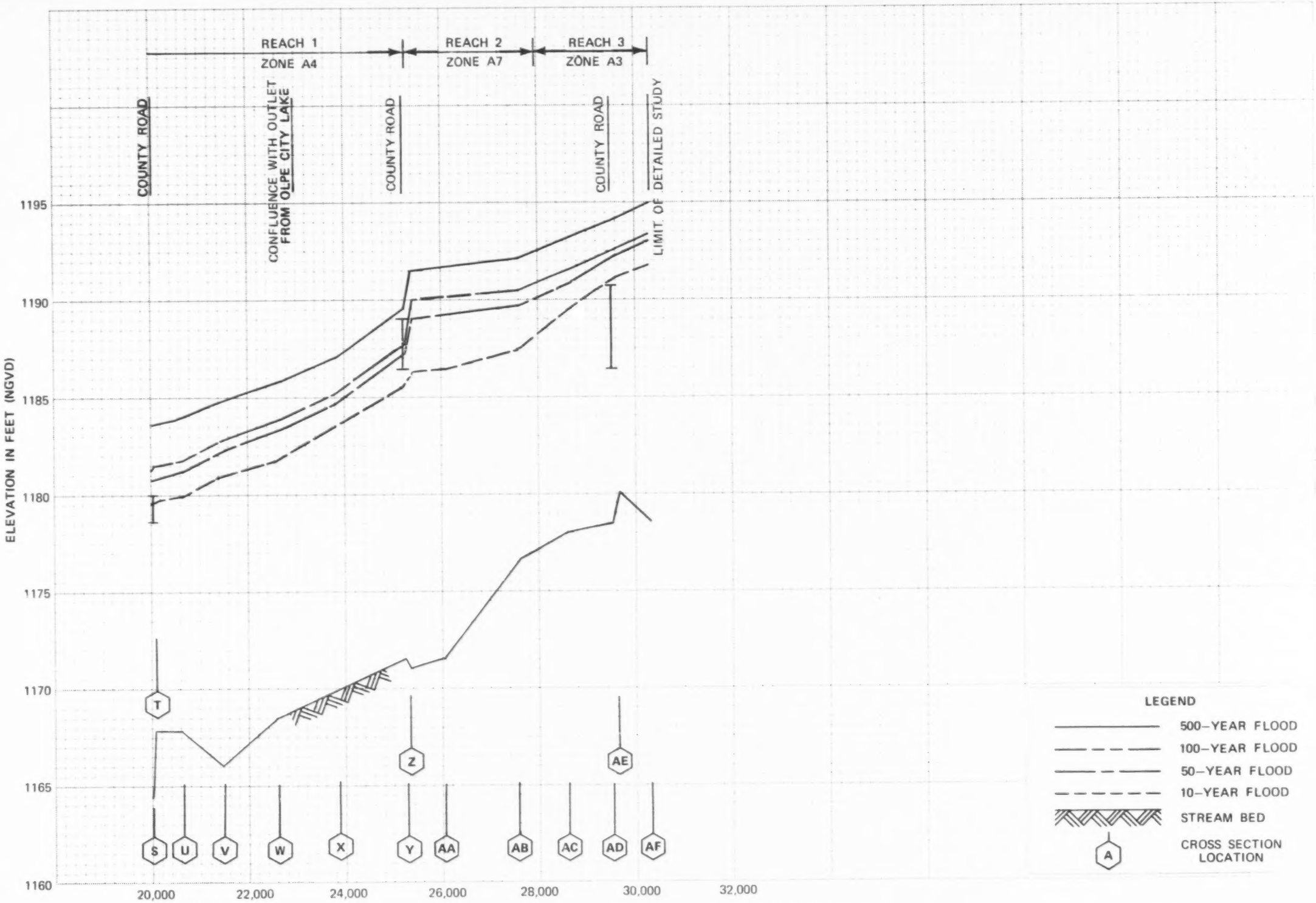
EAGLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

18P

BEST DOCUMENT AVAILABLE



FLOOD PROFILES

EAGLE CREEK

FEDERAL EMERGENCY MANAGEMENT AGENCY

COUNTY OF LYON, KS
(UNINCORPORATED AREAS)

19P

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